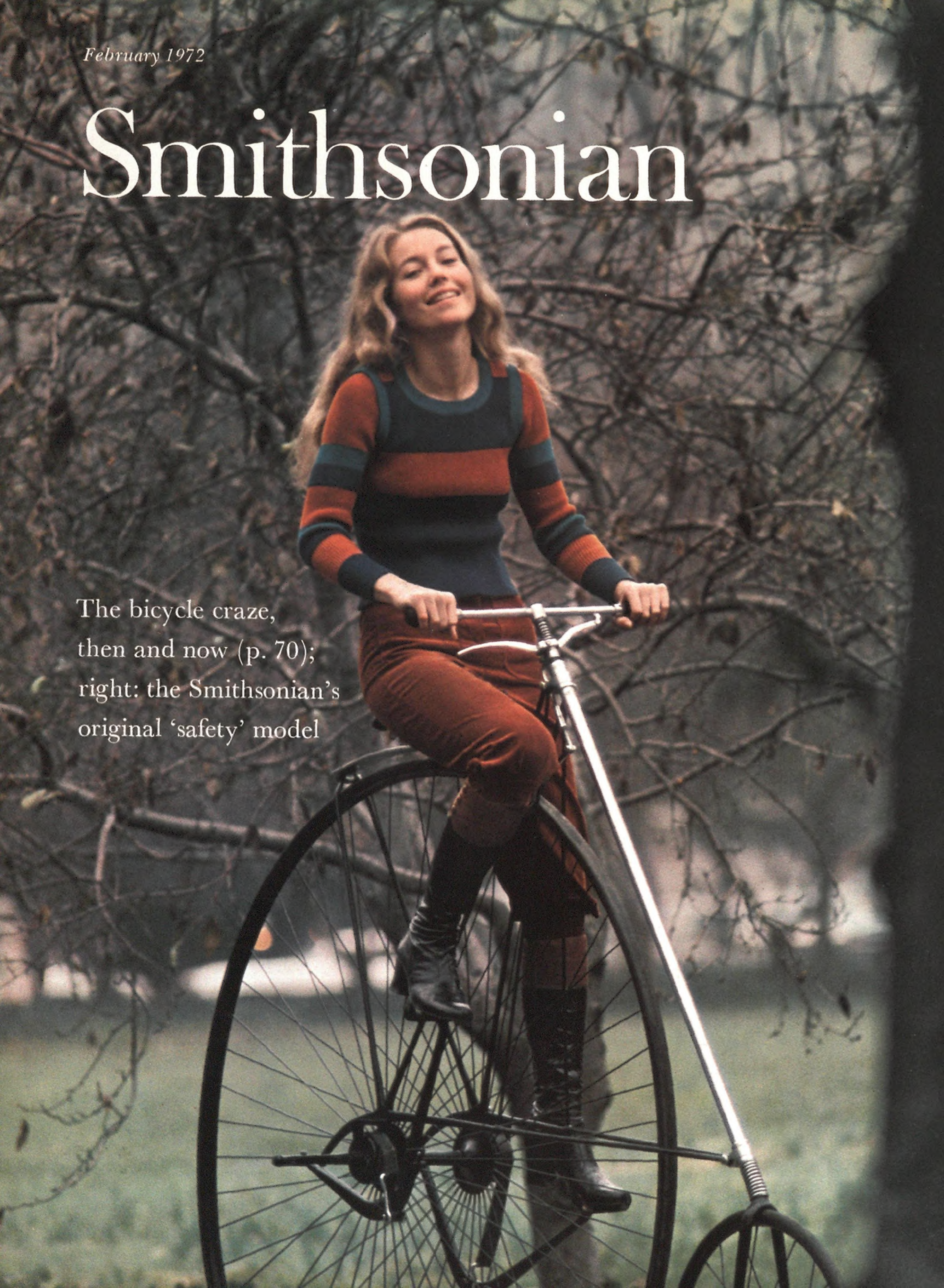
February 1972

Smithsonian



The bicycle craze, then and now (p. 70); right: the Smithsonian's original 'safety' model

The Olds Ninety-Eight.
An exceptional new bumper helps protect a truly exceptional car.

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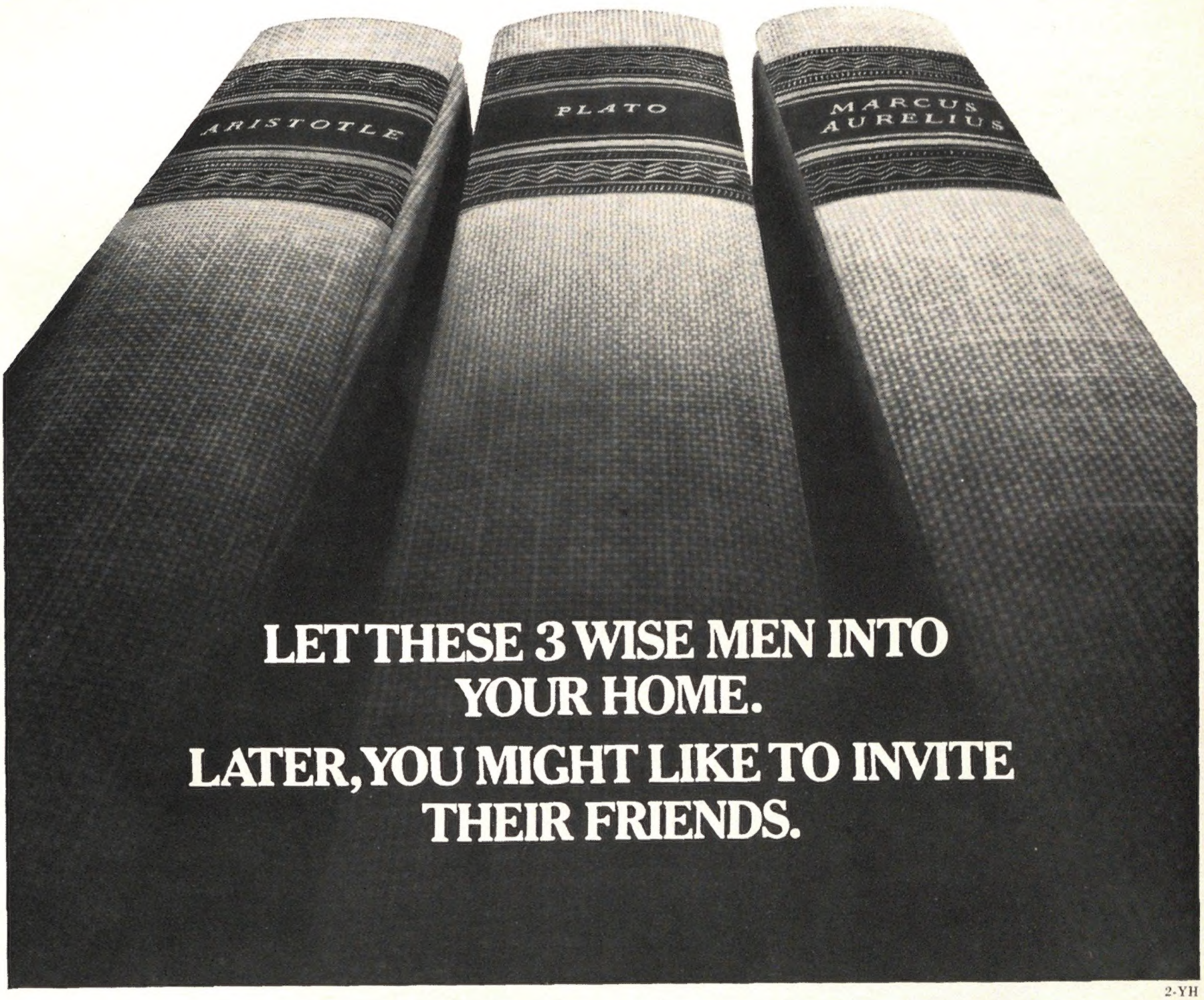

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Smithsonian

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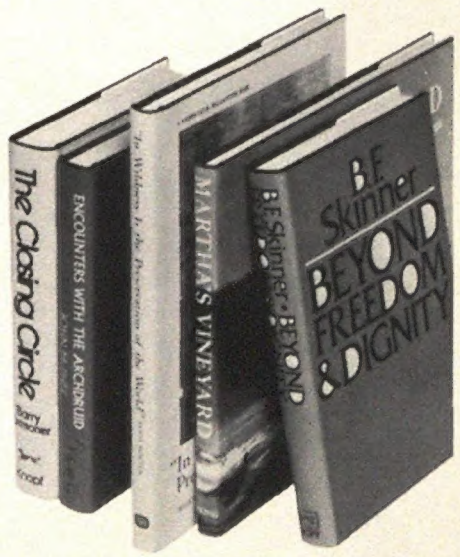
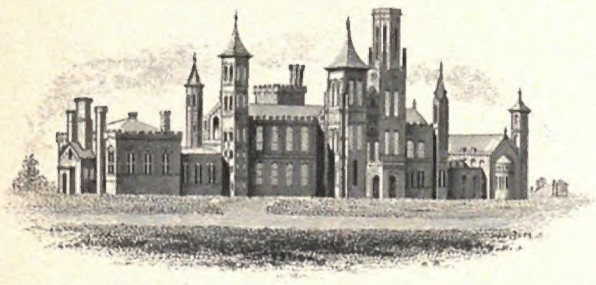


Secretary Ripley's comments

The view from the castle



Although the Treasury Department and the Smithsonian Institution both occupy 19th-century buildings of great charm (the Treasury's is Greek Revival, the Smithsonian's is what might be called Norman Revival—see the article on James Renwick on page 62), relations between the two institutions are somewhat *pro forma*. But we have often consulted with one another, and so it was no great surprise when the Secretary of the Treasury recently called up.

Mr. Connally had just been in Rome. The meetings on international monetary arrangements had gone well; could some small part of the reason be that the setting—the Palazzo Corsini—was so beautiful? The next round was to be held in Washington. Ah, for a palace—or, at the very least, a castle.

Castles are scarce in Washington, said Mr. Connally, but there *was* one: the old Smithsonian. Besides, the Smithsonian was neutral ground. It was neither the Treasury nor the Department of State; it was the very place for an international meeting because it stood for academic freedom, the exchange of ideas, and it had been so ordained by Congress. Would we lend the Smithsonian castle for the meeting of the ministers of the ten participating nations?

I said: the "casa" is yours. And so for two days, December 17-18, the historic meeting of the Ten, their deputies and the attendant directors of the International Monetary Fund took place in the elegant chambers of the Smithsonian castle (see pp. 6 and 8).

There were problems. Our special events officer, Meredith Johnson, who was in charge of arrangements, worked for two days with the engineers to make sure the meeting rooms would be comfortably cool. At the coffee break after the first session, all the foreign delegates—belying the European notion that American rooms are always overheated—came to Mr. Johnson and requested *more heat*. The Swedish minister lost his glasses at dinner Friday, and although the building was turned upside down, they were never found. The managing director of the International Monetary Fund, Pierre-Paul Schweitzer, and the Italian finance minister, Mario Ferrari-Aggradi, were trapped in a Smithsonian elevator for 25 minutes; they chatted the time away, and who knows but that the enforced pause was one of philosophic refreshment. Our switchboard operators handled with aplomb 91 international calls, connecting the delegates with Tokyo and Stockholm as easily as they were, on occasion, with New Jersey or Massachusetts.

The lights burned long, and as I drove up late one evening to greet the ministers, it seemed to me that the clock had been turned back and the castle looked much as it did when the first Secretary, Joseph Henry, and his staff "lived in" in the 1870s.

Whatever the auguries had been, whatever the exceptional skills of Secretary Connally and Paul A. Volcker, his deputy, some magic had been distilled in these surroundings. For, by the evening of the second day, President Nixon himself had turned up to greet the press. The building had exerted its ineffable charm, no fuses had burned out and there had been no real emergencies.

In any case, the Smithsonian is very proud to have played host to such a distinguished gathering. James Smithson himself, scientist and habitué of the gaming tables of Paris, would have been pleased—and we hope that the "Smithsonian Agreement" will have a permanent place in the annals of our time.

S. Dillon Ripley

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View inside the castle, continued

Top-echelon participants at dinner on December 17 in the castle's Woodrow Wilson Center Library.

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A FOCAL POINT FOR YOUR INTERESTS

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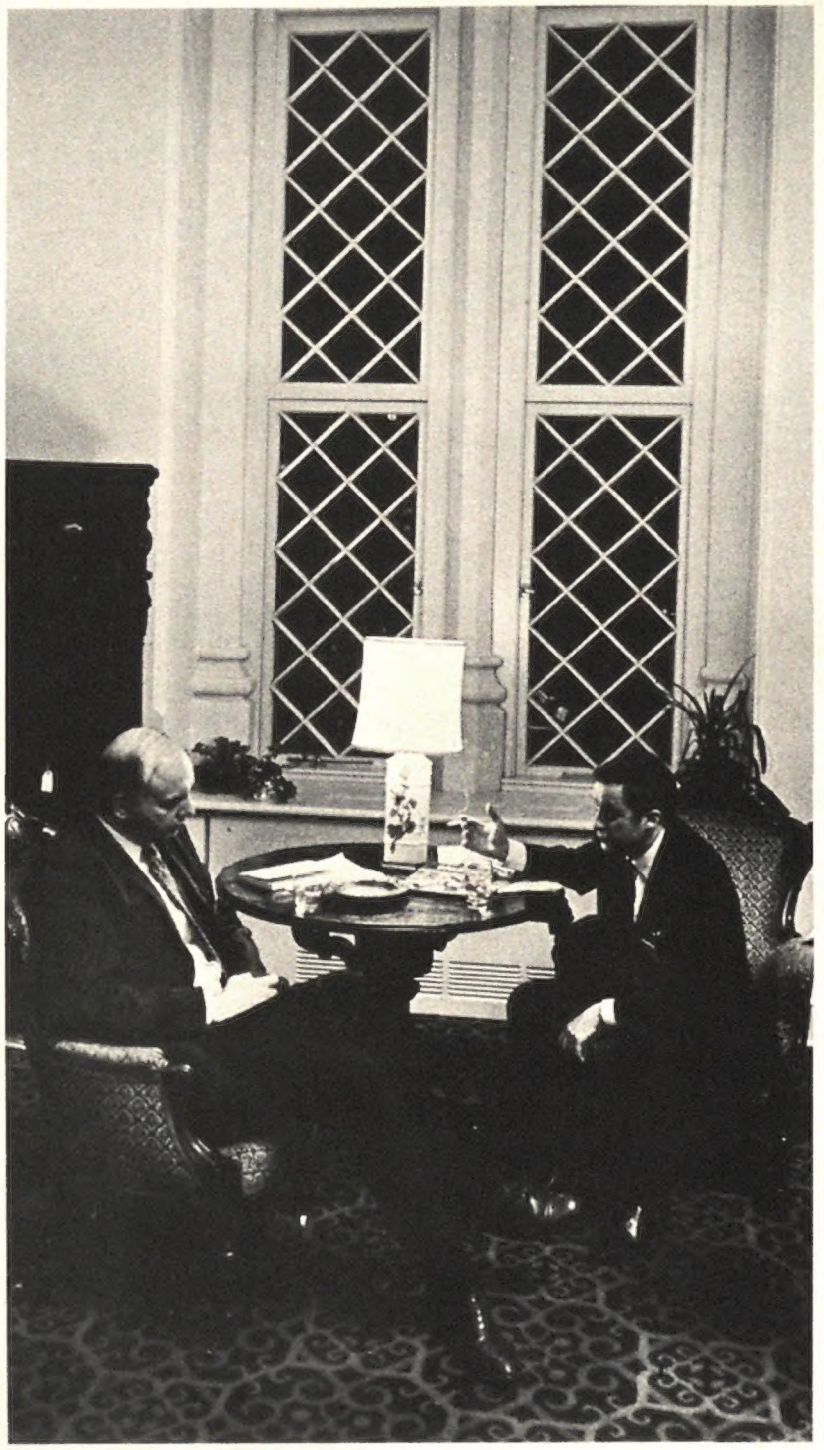
Two delegates from the Federal Republic of Germany, J. Schoellhorn and Dr. Karl Schiller.

Mario Ferrari-Aggradi and Rinaldo Ossola of Italy, Valéry Giscard d'Estaing of France.

Three Americans: Paul A. Volcker, Arthur Burns and Secretary of the Treasury John Connally.

P.-P. Schweitzer, director of I.M.F., Britain's C. J. Morse and Jelle Zylstra of the Netherlands.



The United States' Paul A. Volcker with Kjell-Olof Feldt of Sweden in the Wilson Library.

It doesn't matter who you are. You can't get a Chrysler Imperial that hasn't had a shakedown in Detroit traffic.

ARTHUR GODFREY

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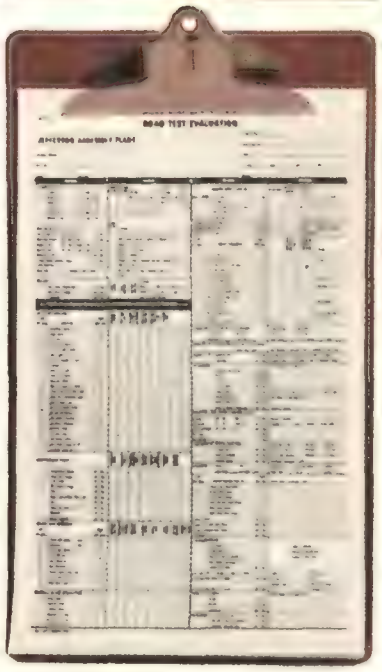

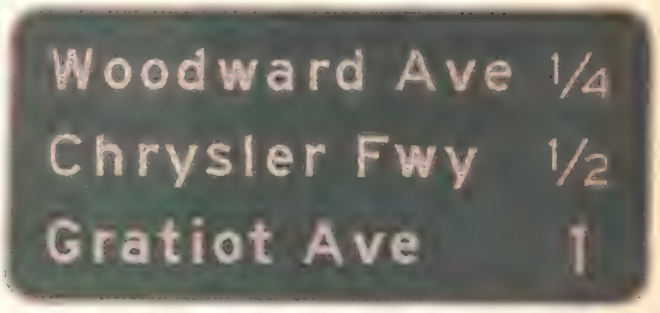

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- Provide hope, self-esteem and confidence—perhaps for the first time in a child's life.

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Introducing a new column

Entitled 'Short-lived phenomena,' it will draw from the Smithsonian service of the same name and other sources

Some 2,500 scientists, institutions and private citizens around the world are stringers for a unique news service, the Smithsonian Institution's Center for Short-Lived Phenomena, located in Cambridge, Massachusetts.

By cable or telephone, the correspondents report sudden events such as the eruption of a volcano to the Center, which immediately notifies specialists who, sometimes within hours, investigate the occurrence in detail.

What's the hurry? Very simply, more can be learned about volcanic eruptions or earthquakes by studying them whenever possible while they are in progress, rather than after the fact. In 1971 the Center reported 19 volcanic eruptions or activity and 21 earthquakes, almost all of which were investigated while in action.

In addition to signaling scientists about the creaks and groans of Mother Earth, the Center also alerts them to extraterrestrial assaults upon her. Hundreds of meteorites hit the Earth every year, but almost all are lost to science because they are unnoticed or because of the lag between the time they are sighted and the time qualified scientists hear of them. In the past year the Center participated in the recovery of six, a bumper year compared to the usual annual take of two.

The Trentino "meteorite"

As with any news service, an initial report requires checking; every now and then a breathless communiqué from the field turns out to be a dead end. Early last fall, the Center heard from an Italian scientist that a meteorite had landed in a bean field in Trentino.

"The meteorite," the report said, "fell a few meters away from the owner of a farm, Mr. Valentine Passamani. Mr. Passamani stated that he suddenly heard thunder in the air which afterwards became a powerful whistling noise.

" 'I raised my eyes to the sky,' he said, 'thinking that it was a plane crashing, but I didn't see anything. An instant later I heard a big thump. The meteorite had fallen five meters away from me, and it had created a crater about one meter deep. When I touched it, it was still hot.'

"The meteorite," the report concluded, "will be examined by experts very soon."

In November, on one of the postcards it sends to its 475 subscribers, the Center succinctly described the experts' findings: "Upon examination the Trentino 'meteorite' was determined to be terrestrial in origin. It is composed primarily of quartz and galena." There was no report on the composition of Farmer Passamani.

Diamonds from space

At about the same time another farmer (an astrophysically more reliable one) on the island of Haverö in Finland reported that a meteorite had fallen through the thick cement-tile roof of his storehouse. Searchers soon arrived but found nothing —until they finally discovered a round plum-sized stone weighing about three pounds, lying neatly and improbably inside a wooden box.

The meteorite had fallen nearly vertically, crashing through the roof and then through the lid of the box.

In subsequent reports the Center has learned that the Haverö meteorite is a rare stony type known as a ureilite. It contains traces of diamond, probably formed when the meteorite's parent planet collided eons ago with another and broke into a pile of cosmic debris. The high shock pressures transformed graphite present in the rock into diamond.

There is no need for protectionist measures by the diamond trade, however. This is only the sixth ureilite ever recovered, and the amount of diamond it contains is almost microscopic.

In addition to geophysical and astronomical happenings, the Center's news

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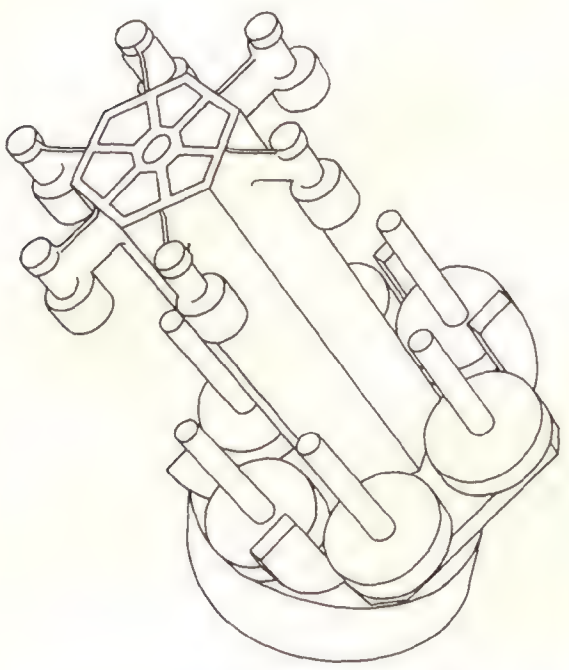
Phenomena continued

includes fish kills, peaks in the monarch butterfly population, oil spills (they reported 16 in 1971), the discovery of an isolated tribe, an invasion of blackbirds or giant snails or any other sudden event of interest to science.

A compound eye on the sky

In about three years the world's third largest optical telescope will take aim at the heavens over Arizona. A radically new type (see drawing), it will cluster six relatively small, 72-inch mirrors around a central core. Light striking each of the mirrors will be focused into a single image, thus producing the light-gathering equivalent of a 176-inch telescope.



Smithsonian's telescope will cluster six small mirrors to get a "big" image.

It will be built and operated by the Smithsonian Astrophysical Observatory (SAO) in Cambridge, Massachusetts, and the University of Arizona, under the direction of a joint committee headed by SAO's director, Dr. Fred L. Whipple. The completed instrument will be located at either the Smithsonian's Mt. Hopkins Observatory south of Tucson or the University's Catalina Station on Mt. Lemmon to the north of the city.

The ultimate location depends on which site has the least light pollution from the city and the least water vapor in the atmosphere; water vapor absorbs infrared light, and the Multiple Mirror Telescope will also be the largest instrument ever constructed for making observations in the infrared spectrum.

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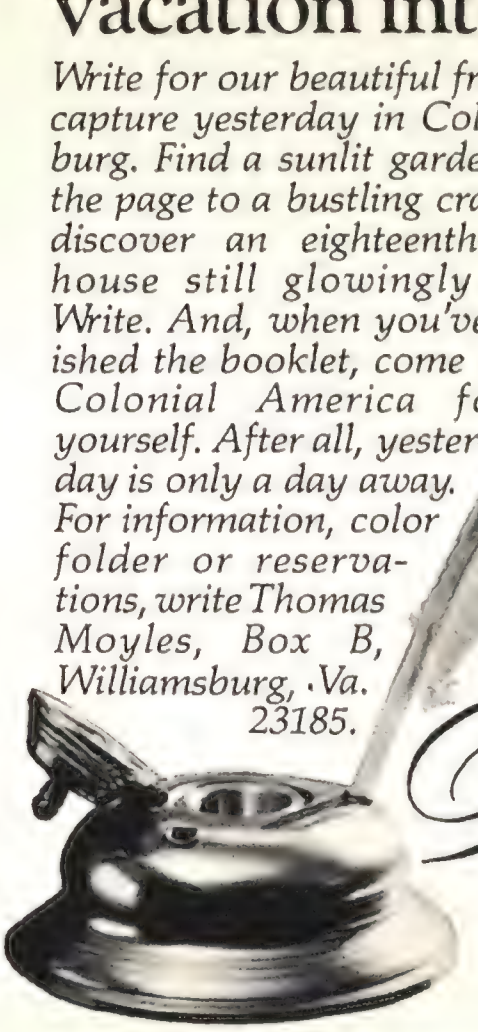

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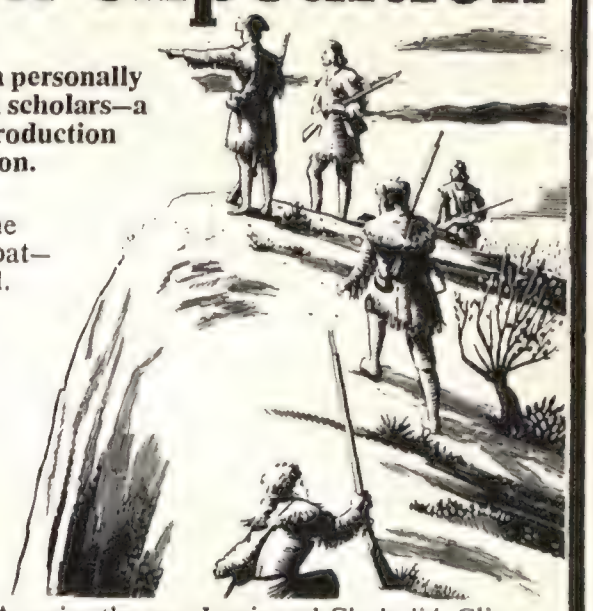

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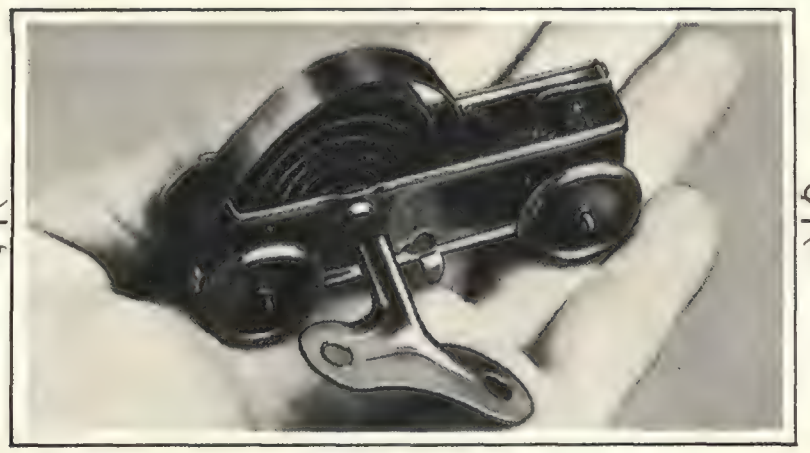

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Phenomena continued

The puffin decline

It was via the Center for Short-Lived Phenomena that the news recently arrived of a decline in the puffin population.

A zoologist at the University of Aberdeen reported that the puffin, long known to be declining in the southeastern part of its range in the temperate North Atlantic, is now apparently in trouble in the northwest too. On St. Kilda, a group of rocky islands 45 miles from the Outer Hebrides, there used to be three million puffin pairs. One mile-long island, for example, was literally riddled with occupied puffin burrows. In 1969, only half the burrows were inhabited and by last fall, only one-tenth. The St. Kilda islands now appear to support only 250,000 pairs of puffins.

The cause of the decline is obscure. Rats, gull predation, human activity, disease, food shortage—none of these seems the likely reason, and there is little local oil pollution, though the migratory puffins may encounter this problem (or others) in distant, unwatched wintering grounds. British zoologists suspect some toxic marine pollutant and are pressing on with the search.

The algae of Galilee

For those who believe that nothing is sacred anymore, the news from the Sea of Galilee may well be the last straw.

The Biblical lake, Israel's sole body of fresh water suitable for camping and recreation, is also a receptacle for peat-bed drain-off, diesel oil from irrigation pumps, landfill for real estate development, garbage and tons of raw sewage. All of this means massive amounts of nutrients for algae, some 20,000 tons of which now "bloom" in the spring and decompose in the summer, consuming much of the water's oxygen. To cope with this accelerating process of eutrophication (see "Lake Erie is aging but effort can save it from death," SMITHSONIAN, December 1970) will take the cooperation of all the many municipalities, townships and regional authorities surrounding the lake. According to *The Christian Science Monitor,* this has not been achieved so far in spite of parliamentary efforts. Unless drastic steps are taken, according to an official report to Israel's water commissioner, the ancient Sea of Galilee has only four or five years to live.

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Letters to the Editor

Alexandrian Museum

Dear Sir: "Math for math's sake," as stated in David E. H. Jones' December article on the Alexandrian Greeks, epitomizes one of the main reasons for the success of those fortunate free Greek scholars, who achieved so much in such a short time. As Dr. Jones describes the achievements of those early scientists, it is fair to say that their work truly established the foundations of modern basic and applied science.

If the unfortunate recent attitude of some of our citizens, who do not subscribe to the fundamentals of "math for math's sake," prevailed, the world might once again be plunged into the Dark Ages.

Congratulations to Dr. Jones and your excellent magazine for giving us articles of this nature, which not only bring to our attention the achievement of the Greeks in the sciences during the Hellenistic period but also serve as a reminder of what could happen again.

Dr. A. J. Tousimis
Rockville, Maryland

Sea-level canal

Dear Sir: Your article on the study of the ecological effects of a sea-level canal is quite interesting from a scientific point of view. But certainly nature has survived far more serious "threats" to her ecological balance. We must keep in mind that even if the studies show that some native species would be destroyed by a sea-level canal, they would be replaced and balance established.

Once we have made our decision, we must then be careful of the motives. Let us be certain that we are concerned about nature and not whether we approve of any new ecological balance for reasons of economy or pleasure.

Thomas E. Simondi
Andrews Air Force Base, Maryland

Dear Sir: The article on the Panama sea-level canal is interesting in that just before closing it tapers off from the usual ecologists' premonition of disaster, but the final sentence reverts to the ecologists' tone. This makes it appear that they would have the final decision as to whether or not the sea-level canal should be built. I believe that the building of the new canal will be based strictly on its commercial and military value.

I also believe that ecologists lose sight of the fact that plankton plays the vital role in marine ecology. If species interchange now from one ocean to the other, the final status will be that plankton will supply the same amount of food fish regardless of the species involved. Man has nothing to fear, since he will have the same volume of food supply with or without the sea-level canal.

Chapman Grant
Escondido, California

Dear Sir: Your article on the projected sea-level canal apparently dismisses with bare mention the one factor that seems to make all the ecological studies highly academic: a two-foot tidal range on one end, and the 18-foot range at the other.

Would not this produce a rate and speed of flow of enormous proportions? I would hate to take a Navy destroyer through, with all its power and maneuverability. What will the poor skipper of a supertanker do with his tremendous size and modest horsepower? The monstrous vessels which such a canal is intended to serve can handle most any sea condition in open ocean, but are relatively helpless in close quarters.

Carlos M. Cardeza
Rear Admiral USNR (Retired)
Houston, Texas

Our article dealt specifically with the biological problems of such a sea-level canal and did not try to describe all the ecological problems. The Atlantic-Pacific Interoceanic Canal Study Commission has published (1970) the detailed results of an engineering feasibility study. Among its findings the study concludes that although a flow would result from

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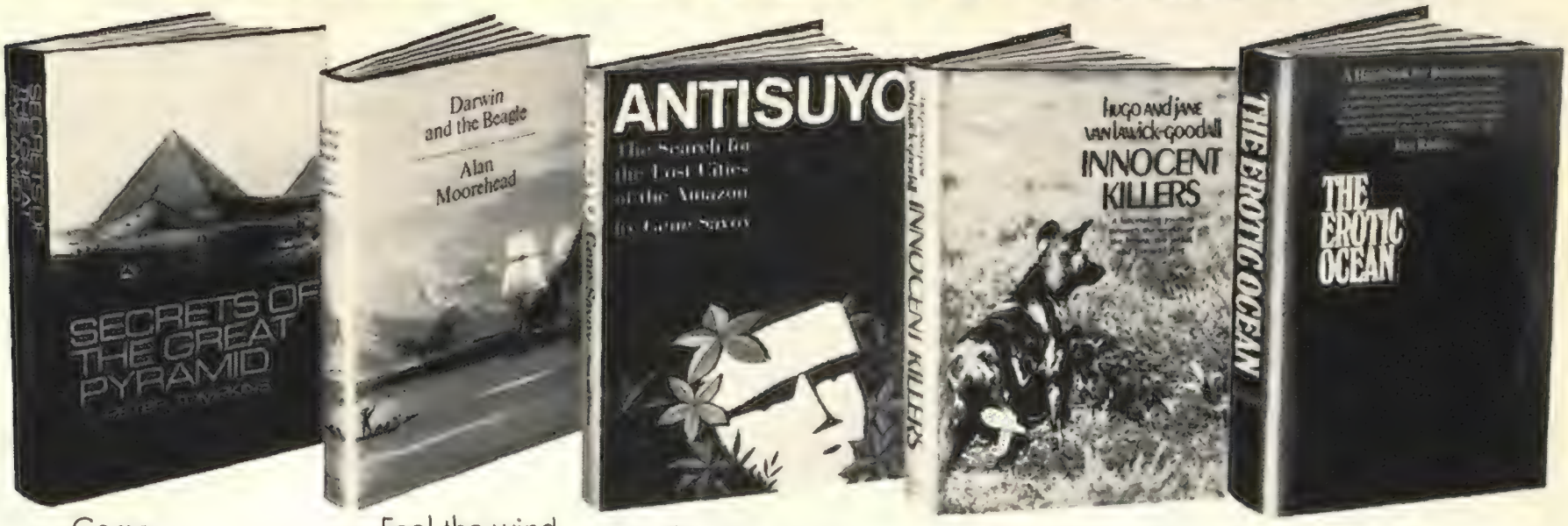

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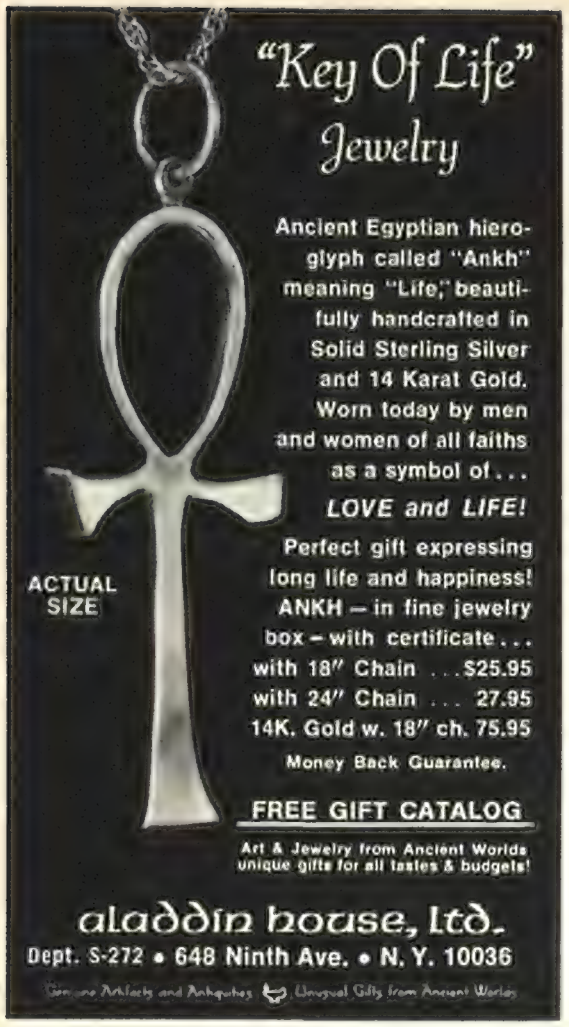
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the differences in tide elevations, it would not be of enormous proportions because these currents, like the tides, would be cyclic, changing direction every quarter of a lunar day. Magnitude of the current would vary with the momentary differences between ocean levels, the cross-sectional geometry and length and hydraulic roughness of the canal. Controllability requirements would be placed on the ships that navigate the canal. If only a few ships could not meet these requirements they could be scheduled to avoid strong currents. If many ships were involved, the most promising solution appears to lie in the use of tidal gates which would check the flow of water during tides causing unacceptably high currents. Ed.

View from the castle

Dear Sir: Secretary Ripley's comments in the November issue about the need to study how "tribal peoples are responding to life as it is today" was of much interest to me. I am currently working on an anthropology degree.

Last summer, I spent many hours visiting villages of various Apache tribes. Many more hours were spent digging at Hohokam ruins and in travel to various cliff dwellings.

Walking through these deserted ruins I wondered how life must have been high in the cliffs. Most of all I wondered why these people left. Where did they go, and why must everything eventually yield to modern times? Extinction of a language, a culture or a people is indeed sad.

There are many of us students who feel a responsibility to study other peoples, tribes, their kinship systems, their cultures and their languages. But, all too often, there are no sponsors or grants, and undertaking such studies on their own is out of financial reach for most students. We can only apply our interest and knowledge to further exhaust our respective immediate vicinities.

Brigitta G. Ludgate
Tucson, Arizona

Thievery

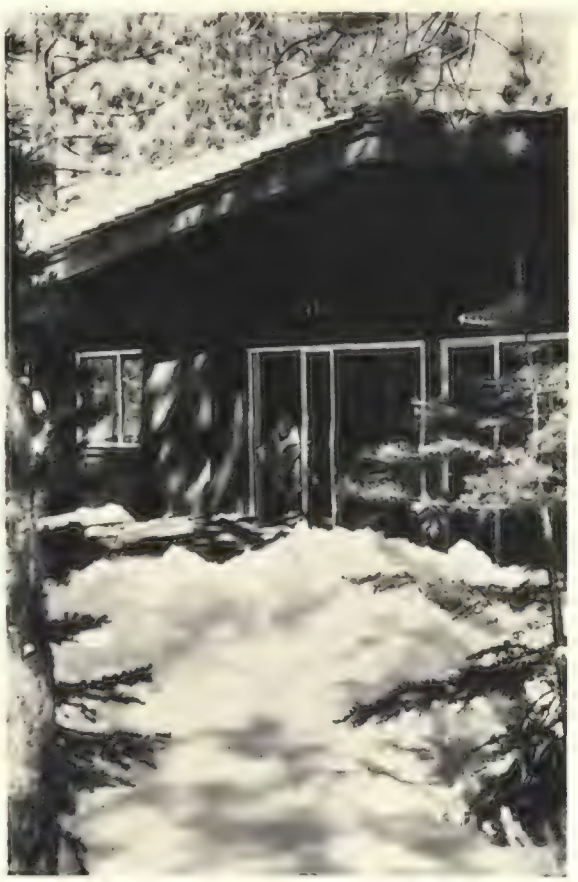
Dear Sir: In your December Letters, the one by Scott Landis about his cabin ("My home is yours") and the retort, in a sense, by Nancy Jack ("My purse was snatched right off my arm") give me pause.

Currently, I live with my family in a mountain cabin high above Lake Tahoe, California—as a guard, or nearly so. My cabin has been ripped off *three* times in as many years. The other day, two cabins not a quarter of a mile away were vandalized and cleaned out completely.

The authorities seldom catch these cabin thieves. And it is becoming very big business. When they are caught, they break about 50/50 between hippies "living off the land" and cheapskates who want to furnish their own pads free.

Thievery is a popular pastime. I suggest Mr. Landis will have very little left if he hangs out the "welcome" sign he promised. It is sad that this is true, but in my experience, it *is* true.

William Childress
South Lake Tahoe, California



The guarded cabin

Batavia accelerator

Dear Sir: In your December 1971 article, "A huge racetrack for protons at incredible speeds," the author expressed some hope that the Batavia accelerator would be in working order that very month.

That hope did not materialize. Instead, physicists at the National Accelerator Laboratory found that water had condensed in the big magnets, requiring at least one-third of them to be reconditioned. Also, the proton beam has proved unsteady, perhaps because of some yet

undiscovered obstruction in the four-mile long vacuum chamber.

Repairs are underway and the physicists still hope to get the huge machine operating at its full energy by the originally scheduled completion date of July 1, 1972.

Hercules Pipes
Washington, D.C.

Poplar Island

Dear Sir: Let me express full agreement with the ideas of David Challinor's article. The forces of nature controlled this planet long before Man appeared on the scene. So while we do regret the passing of certain species of wildlife, change is part of evolution and that process is not yet complete.

As Dr. Challinor says, let's spend money on antipollution projects and the like. We can better control Man's assault upon his planet than repair the natural, normal changes which the forces of nature rule.

Frances Shumate
Atlanta, Georgia

Dear Sir: In the discussion of the natural processes of erosion on Poplar Island there was no mention of the natural processes of preventing erosion.

The sea grasses, where established, as on nearby Coaches Island, effectively halt erosion. A strong wave is reduced to a ripple in a few feet of sea grass and, more important, the wave is prevented from breaking—a prime cause of erosion.

Raymond W. Warren
McLean, Virginia

Dear Sir: It occurs to me that the salvation of Poplar Island might be brought about at a minimum of expense by planting bamboo on the island. A mature grove of bamboo is locked together by a mat of roots and interlacing rhizomes.

David A. Caccia
Sewell, New Jersey

Many natural forms of erosion control were considered but rejected after study as unfeasible. The waves on Poplar Island are too strong and the water too turbid to establish sea grass. A hardy species of bamboo could probably survive. But there is danger of its taking over the island. Bamboo is almost impossible to control, and its interlacing mat of roots forces out other vegetation. Ed.

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By S. Dillon Ripley

Extinction's tide and the ripples and eddies of hope

There are species gone and species going.
A few we still can save and, occasionally,
a mourned species turns up alive and well

"Whatever happened to the white-winged guan?" an ornithological friend of mine asked me the other day. This pheasantlike bird is known to science only by three mounted specimens, one of which is in a museum in Lima, Peru, and it was the specimens about which my friend was worried. "I can't find out what happened to the other two," he said.

The other specimens are said to be in Warsaw and London, but I'm not sure. Moreover, no one knows where the white-winged guan itself is, beyond the fact that it was found in 1876 near Tumbez on the northwestern slopes of the Peruvian Andes and described by Count Taczanowski in 1877. Having thus been described and registered for science as part of the inventory of living things that the great 18th-century encyclopedists felt was the way to record the six days of Creation, the white-winged guan disappeared from human sight. It hangs there like a dangling participle.

Is it worse really not to know?

We *do* know a good deal about the dodo. It lived, though we don't of course know how long, on the tiny Indian Ocean island of Mauritius. Before 1628 the Dutch landed pigs on the island, in Robinson Crusoe fashion, to maintain God-fearing shipwrecked sailors. Pig reproduction and appetites being what they are, the dodos lasted barely 50 years after this mistaken

Illustrations by Daniel Owen Stolpe

In addition to his duties as the Smithsonian Institution's secretary, biologist S. Dillon Ripley is writing a book on the marsh birds of the world.

Among the annals of the forever lost are
the solitaire of Réunion (lower left corner),
the dodo and (upper right) the red rail.

Huddled in the lower right and also extinct are
the blue rail, the Mauritian pink pigeon
and, again from Mauritius, the pigeon hollandais.

piece of Dutch philanthropy, having disappeared by 1681. Now we know about the dodo from fewer than a dozen sketches and paintings, a collection of bones from a Mauritian swamp where the birds were evidently trapped by their own weight and clumsiness, and by some skin and head fragments at Oxford—pieces from what was the only preserved specimen.

In 1755 the curator of the museum in Oxford saw a moth fly out of the stuffed dodo as he passed by.

"Take that dodo out and burn it. It has a moth," he said. The skin and head fragments were salvaged—by someone unknown—from the little conflagration in the courtyard, so we are at least tantalized by fragments. Are we better off knowing even that much about the dodo?

During many years in India I had always dreamed of seeing a pink-headed duck, an angular bird, its body clothed in sober brown plumage with a little creamy gray on the wings. Its real glory was the head and neck which, in the male, were a brilliant shade of pink, Schiaparelli "shocking pink"—a most implausible creature.

None has been seen since before World War II. The last place where they seemed to occur in the wild was Darbangha, the state of a rich maharaja in the Himalayan foothills in Bihar.

In 1948 I heard from a Mr. Danby, a retired agent for the maharaja, and my saddest thoughts were confirmed. "Each winter," Mr. Danby wrote, "the maharaja's hunters trapped a good number of migratory duck on the local *jheels* (ponds), and brought them to a large aviary which the ruler had constructed. I remember occasional pink-headed ducks, which were of course rare, and local, caught in pairs.

"During the winter, the maharaja ate all the duck, the aviary serving as larder." How sensible of him, but how sad to think that as he ate the last cooked pink-headed duck, probably boiled for a curry, the maharaja didn't even realize what a special gustatory triumph he was enjoying. How many people in the world have ever eaten a pink-headed duck?

So we know the fate of the pink-headed duck and the dodo, if not the white-winged guan, but what good does it do to know? Perhaps it is only morbid to eulogize these minor disappearances. Perhaps they only tell us something about ourselves that we would rather not be told again.

Of course evolution is far older than we are. To be sure, long before Man's appearance, many life forms had become extinct as the result of vast climatic changes, mountain-building and continental movements. But from my own subjective point of view, what fascinates me is what has happened in the last two million years since Man arrived. That is merely 1/1,250th of the time during which life has existed on Earth, but it is a big enough fraction of time for me, and what is intensely interesting is the effect Man has had on his surroundings in that period.

For example, it seems likely that the present problems of the Middle East, which are economic problems as much as anything else, had their origin long before written history in the discovery of how to domesticate animals—sheep, then goats and then migrations of flocks from settlement to settlement. From North Africa to India, a limited rainfall supported acacia forests, a dry savanna land of limited species of grasses and shrubs and large populations of a few animal species ranging from lions and ostriches down through antelope and game birds and a variety of smaller orga-

Bustards once ranged widely over the world.
Now endangered, they are protected in many areas.

nisms. It was a fragile environment, and grazing by domestic animals, once begun, was irreversible. Destruction of savanna forests is a one-way street. Perhaps the nomads never should have left the Middle Eastern hillsides where more ample rainfall guaranteed a higher yield.

All over the world we can see the result of overgrazing: the creation of deserts in former savanna land. From experiments recently performed in western India, it seems highly probable that once the desiccating process begins, rainfall is itself affected. It seems to rain less in areas of man-made desert, and a "dust-bowl" phenomenon results, made worse as political stability replaces nomad life and as populations concentrate and breed mightily in cities, making even heavier demands on the surrounding countryside.

It is too bad that historians or political scientists don't make more of this sort of thing. Politicians normally have no knowledge of their nation's biological past. In the Middle East, President Bourguiba of Tunisia knows the menace of goats. Through his tree-planting schemes he has begun to try to change the face of Tunisia. The cedar is the national emblem of Lebanon; a huge welcome sign to Beirut has a cedar tree appropriately cupped by hands in prayer.

The depredations of early Man

The drastic effects of human activity on the environment are not new, and today we reap the harvest of actions taken long, long ago, even those taken well before written history.

Large and dangerous wild animals such as the cave bear, cave hyena and cave lion of northern Europe and Asia seem to have been exterminated by early Man. These fierce creatures would have been difficult to kill; the simplest way would have been to kill off the young. Remains of young cave bears have been found in circumstances that indicate death at human hands. The gradual removal of the younger, more easily hunted animals would lead to the extermination of the species. So it must have been over much of the emerging world of the hunter.

Traps, deadfalls, overhanging cliffs, culs-de-sac into which stones and spears could be hurled—all contributed to the charnel heaps of old bones we now find. In the United States there are the remains of stone walls placed on hillsides into which herds of bison could be guided, only to stampede over a low cliff and die in large numbers—probably in larger numbers than were necessary. It is possible, though, that the Indians husbanded their wild supply of food and tried to kill only a few animals at a time.

In any event, the bison probably got a temporary reprieve when the Spanish introduced the modern

The fearless moa of New Zealand towered 12 feet high but it fell to early Polynesian settlers.

horse into North America in the 16th century. With increased hunting skill, the Indians would have been able to take more mature animals rather than young ones, and vigorous, young breeding stock would have grown rapidly. Then, of course, white buffalo hunters with skills even more efficient than those of the Indians finally attacked all age classes of the animals and nearly extirpated the species altogether, until Dr. William Temple Hornaday of the New York Zoological Society painstakingly reared some bison and in the early 1900s began shipping them west to recreate the herds now found.

Of course, it is difficult for us today to be sure how many animal species have vanished since Man developed fire and weapons. Added to the unfolding tale of the prehistoric hunter and of agricultural Man, the changer of whole environments, is the subsequent exploration of the world and its remote territories and islands. Vulnerable, isolated, flightless and fearless species fell like ninepins to skillful human explorers.

Not just Western Man: New Zealand had a whole family of flightless birds called moas, ranging from turkey-size to 12-foot giants. In the tenth century Polynesians came and within eight centuries, as Captain Cook arrived, the moas—all of them—were gone.

Lee M. Talbot, Smithsonian ecologist and senior scientist on the President's Council on Environmental Quality, has pointed out: "Since the time of Christ, Man has exterminated about two percent of the known species of the world's mammals. . . . However, more than half of these losses have occurred since 1900. During the past 150 years the rate of extermination of mammals has increased 55-fold." If the same rate were projected into the future—hopefully a most unlikely possibility—"In about 30 years all of the remaining 4,000 species of mammals could be gone," except presumably domestic species, including humans.

Scientists question such projections. Projections are not, after all, facts. When Rachel Carson published *Silent Spring,* plenty of scientists rallied to the pesticide industry and said that so long as all her suppositions were not proved, her statements about the dangers of insecticides were not only exaggerated but therefore possibly erroneous. At least they were nothing to worry about until they were proved. Scientists often forget that the French physiologist, Claude Bernard, said it is *not* against the rules for a scientist to make a supposition and believe it until he can prove it.

Orthodoxy in science comes from following the rules and subscribing only to proven facts, but if that is the only path to follow, science would have perished years ago.

In my own case I have been interested in the tiger since I first came across it in the wild as a boy of 13. In the 1920s there were maharajas in India who had records of 500 or more tigers killed by themselves. It was the "hairy-chest syndrome"—a grand piece of one-upmanship. Colonial officials in Asian countries where the tiger occurred were given their quotas. Retiring governors in India always had the chance of one last ceremonial "durbar" at some maharaja's court and a "camp" somewhere with a tiger beaten up to the butts by scores of villagers, to be picked off by the governor's rifle. The governor might have a palsied hand or fading sight, but the maharaja's son or another keen young sportsman would be sitting beside the nabob in his tree platform, ready to press the trigger of his no. 2 gun so that there would be no failure, and the trophy would go safely home to be mounted, snarling out into dusty space.

War came to Asia and with it guns fell into everybody's hands. Forest and game departments of former colonial regimes withered under the new republics, and a tide of destruction was unleashed as economic development speeded up with new technologies.

In the last 50 years the tiger in India and Pakistan has shrunk in numbers from being "abundant," whatever that means (let us say more than 40,000 animals at least), to what I would guess is fewer than 2,500, perhaps only 1,000, and exists only in limited areas at that. Poaching, $7,000 women's coats (most unsuitable—tiger fur wears out and rubs badly) and occasional tourist hunts with a chance for the sportsman to bag one of the trophies (the same old hairy-chest stuff for the new rich), have accounted for the big decrease. So has grazing by cattle in former forest preserves, thus

The Arabian oryx once patrolled most of the Middle East. Its chances now rest with zoo keepers.

One could guess that the tiger will be extinct
in 25 years. Perhaps only 1,000 now live in the wild.

eliminating the tiger's natural food of deer and pig.

Three years ago I made a dangerous statement in a speech before a naturalists' society in Bombay, to the effect that the tiger would be extinct in 25 years. It made the newspapers and people were incredulous. I jeopardized my reputation as a biologist by speaking out without provable statistics—merely hazarding a guess, based on 40 years of visits to India.

But surely a scientist can have a hunch. I feel in my bones that the tiger can disappear in a twinkling, leaving hardly a trace. It is a supposition and one I would like to see *not* proved. But the odds are not good these days for wild creatures, and it seems unwise to wait for all the facts to be proved before acting.

Take birds: Some 95 species and almost as many subspecies and local populations have been recorded as having disappeared since 1600. Presumably there are others we don't know about. Presently almost 200 species and perhaps an additional 150 subspecies of birds are listed as endangered. Project *that* rate. How long before the rest of the 8,600 known bird species follow the mammals? Another unprovable supposition, perhaps, but it is well to consider the odds against the birds. Consider the widespread development of the Earth's more remote places since World War II, the vast increases in human populations, the eradication of human diseases by new chemicals and the general dissemination of arms.

The old codes of hunting still persist. The sport is no more sport, the food is not a vital necessity, but the old customs die hard. In the deserts, new rich men hunt game by age-old prerogative. Thus, for example, the houbara bustard, royal game of old, has disappeared from Arabia and is making its last stand in Pakistan. What to do? We could let them all vanish without a trace. But if that is our course, as Alfred Russell Wallace wrote in 1863, "future ages will certainly look back upon us as a people so immersed in the pursuit of wealth as to be blind to higher considerations. They will charge us with having culpably allowed the destruction of some of those records of Creation which we had it in our power to preserve; and while professing to regard every living thing as the direct handiwork and the best evidence of a creator, yet, with a strange inconsistency, seeing many of them perish irrecoverably from the face of the earth, uncared for and unknown."

Wallace was in favor of museum specimens and the value of this scientific record. Better, to Wallace, to know that there was a mounted white-winged guan or a pink-headed duck and to look at them once in a

Blackbuck antelope, mostly gone from the plains of India, gained a reprieve on Texas ranches.

while like visiting old gravestones. And of course, there's always the chance that we might have been fooled all along, and the creature might just be hiding, not extinct. We live on hope.

One course of action, and perhaps the only one at this time, is to keep breeding stocks in captivity, waiting until education has replaced outworn rituals.

A wild animal in captivity is not an ideal arrangement. Speeding over the desert sand dunes, the Arabian oryx is an ethereal-looking animal; in a California or Arizona zoo, it seems a rather squat, dumpy creature with odd needle-shaped horns (O horns of symbolism—of the unicorn and the virgin, of prowess and virility—those symbols will kill you in the end if you don't watch out). But in zoos, in captivity, these animals can be bred successfully. The same goes for the blackbuck antelope, now virtually gone from the plains of India but being bred in plenty on Texas ranches. Already a first shipment of live blackbuck has been flown to a new preserve in Pakistan.

We all hear of disasters. As the president of the International Council for Bird Preservation, I am likely to hear early of certain kinds of successes. Last July, for example, the first nesting of the lovely little Hawaiian goose since perhaps the turn of the century was observed on the island of Maui. It was feared on the verge of extinction, the victim of poaching and the destruction of its nests by wild dogs and cats. But it reappeared, was saved by a few dedicated men, reared in captivity and flown back to be released on its old and now protected range, first on the main island of Hawaii, now on Maui.

The Aleutian Canada goose, a geographically isolated miniature of the Canada goose, was thought extinct until sighted on Buldir Island in 1962. Now, at this writing, the U.S. Fish and Wildlife Service and a group of cooperators including my wife and me are rearing young Aleutian geese for eventual release on those islands of the chain that are fox-free. There are more Aleutian geese in captivity right now (nearly 100) than there were left on Buldir Island in 1962.

There are ups and downs in this business. Bermuda petrels, also called cahows, are good to eat, especially young fat ones. The 17th-century colonists on Bermuda ate most of them. A few survived on rocky islets until the 1940s, when the bird apparently vanished. Suddenly, in the 1950s, a few were found on an offshore islet, causing such an ornithological sensation that it was kept quiet at first for fear of over-eager birdwatchers. There were some left, we whispered among ourselves, perhaps a dozen. We took measures to protect the young petrels against the attacks of white-tailed tropic birds which also nested there, and all was serene for a while. The colony built up to 24 nesting pairs this year, with 50 percent reproductive success. But the birds are full of DDT, ingested at sea, presumably from the bodies of tiny Atlantic shrimp and other planktonic food. The cahow seems doomed all over again.

Another success is the takahe, a huge gallinule—flightless, with purplish blue irridescent feathers and a powerful-looking reddish bill. It was described by A. B. Meyer in 1883 from a single specimen that reached the Dresden Museum. It had come from a lake on South Island, New Zealand, and the species was not seen again after a dog caught one in 1898. Not, that is, until 1948, when climbers found a colony of fewer than 100 birds in a tiny steep-sided valley high in the Murchison Mountains. Protection may yet save it, just as vigilance may save other vanishing species like the whooping crane and the California condor.

Just after World War II, but before the takahe had been rediscovered, an ornithologist asked me, "What ever happened to the takahe, the specimen I mean?"

"You mean the one in Dresden?" I replied. "Don't know, just vanished." It is nice to be able to report now that the live takahe still exists, whatever the fate of the specimen. I suppose we must be content with small triumphs, but they are rarer every year. All over the world today species are dropping off, in a twinkling, like the lights of fireflies, into limbo.

Whatever happened, whatever happened? Often now we don't have the answers.

Whatever happened . . .? Sometimes I feel the voices are trailing off like those of very old men talking about former, and now lost, acquaintances.

Long thought extinct, the gaudy takahe (left) was found again on New Zealand; the Hawaiian nene has been brought back by dedicated men.

By David Snell

The green world of Carrie Dormon

Naturalist, artist and author, this gentle eccentric opened a small boy's eyes to the wonders of her Louisiana woodland

The obituary placed the time of Caroline Dormon's death at 5:30 A.M. Yes, I thought, that is how it would be. That was *her* time. She had awakened each day at first birdcall and before first light. It was her hour for hope and the sensing of weather and the making of plans, and also for summations and the setting of things into order. Just as she lived by the rhythms of sun and season, so she would die by them.

Since my childhood I had known Carrie Dormon, botanist, ornithologist, prizewinning horticulturist, painter and author of six books. She was perhaps the foremost authority on wild flowers of the southern United States. She was an old and dear friend of my mother—also a writer. But when, some weeks before Carrie's death, I paid her a visit in Saline, a crossroads village in the piney hill country of northern Louisiana, almost 40 years had passed since I had laid eyes on her.

She was not at her beloved Briarwood, the Dormon homestead where she had spent most of her 83 years with her younger sister, Virginia, and where she had lived alone since Virginia's death. This log house set in a tiny clearing surrounded by 120 acres of wooded hills and gullies was Carrie's wilderness laboratory and the source of her inspiration as scientist, artist and human being. Here she stuck things into the ground in natural settings and made them grow—and then sketched and painted them. I think she was personally acquainted with every twig.

This time the only answer to my shouts were the hammering of a woodpecker somewhere yonder and the sighing of the high pines. I made inquiries in Saline and finally found her at the home of Mrs. May Nichols, a friend. Under a bright kitchen light, Carrie sat huddled at supper, picking vaguely at a piece of fried chicken.

"Carrie, honey, look who's here!" said Mrs. Nichols, beaming and elevating her voice the way people do when they speak to the very old. "It's somebody you know—come to see you!"

Aroused from her old soul's reverie, she turned to inspect the visitor. The glow of fox fire was still in her eyes, just as I remembered it from the halcyon summer of her life—the time which I, as a child, had been sometimes privileged to share. . . .

"There she is," my father said as he wheeled our Chrysler coupe into the clearing, and then, with his disarming irreverence for the people of my mother's literary world, "as usual, keeping company with skunks and scorpions."

He, the outdoorsman and deer hunter (which fact not even he dared mention in Carrie's presence), had been the first to spot her, moving like some shy creature of the forest. Carrie Dormon emerged from a glade of fern and shadow and then paused in the leaf-mottled sunlight at the edge of the clearing. With variations, this was how it would begin, on our many visits to Briarwood during the Twenties and early Thirties —visits which now seem to meld into but one.

She was tall and sinewy—all whipcord and piano wire—with fresh earth on her hands and apron. There would be a cocklebur or two caught on the hem of her skirt, and bits of leaves and pine needles or wisps of cobwebs and cocoons stuck to her shoulders. Her complexion was fair. Her hair—braided into a crown or pulled back severely into a bun—was the color of straw. When you were closer you could see that her eyes were the green of chlorophyll and had a quickness about them, like the eyes of a squirrel, conditioned to detect the barest flicker of movement.

Carrie had stopped to look us over. Had we been hunters and then defied her command to retreat, she was perfectly capable of backing her play with the .410 shotgun she kept handy at the house.

The sound of our approach had taken her away from whatever she had been caught up in, stretched out on a slippery slope of pine straw to examine some

A former Life *editor (and professional wrestler), David Snell wrote the article on Houston's Rothko Chapel in last August's* SMITHSONIAN.

minutiae or on the mossy bank of the clear stream; or adrift in her pirogue on the spring-fed pond, studying leaf patterns on the overhanging limbs or feeding grasshoppers to those wariest of creatures, the mud turtles, which nevertheless would take food from her fingers; or bent over her writing table or at the easel in her studio shack in the woods beyond the pond; or perched high in the branches of a sweetgum or chinquapin, conversing by whistles and warbles with birds which had been known to pluck hair from her head for their nests.

The sight of our car as seen from across the clearing would tell her nothing. All automobiles looked alike to Carrie and she detested them all, including her own. The clue was the block of ice tied on the front bumper, dripping into the dust. This signaled that we came as friends and had been here before. All friends knew that ice was always in short supply at Briarwood. So now she would rush forward, squinting at us through the windshield.

"Well, land sakes! Look who's here! Sister! Sister! Run out here right quick and see who's come! Oh, my, isn't this the cutest, most wonderful thing?"

I can hear her now, calling to Virginia, the *indoor* Dormon, whooping and prancing about like some bamboo-stemmed marsh bird, and swinging her arms high over her head, with palms aloft and fingertips pointing backward, in delight and disbelief that Heaven should have chosen to so bless this day.

Virginia would appear in the doorway, darkly beautiful with her deep auburn hair, peering through her horn-rims into the brightness to see what the excitement was about, trying to focus to the distance if she had just laid down Shakespeare or Milton, or drying her hands on her apron if she had just come from her own theater of artistry, the kitchen.

Carrie meanwhile would have embraced my mother and given my father a prim handshake, and would have hugged me with such crushing strength that my ribs would seem on the point of snapping. Then she and my mother would head for the porch, rattling on about who among their friends had published what and been told what by which editors. There would be kisses and hugs from Virginia, who would express stunned surprise over the block of ice.

Inevitably I would be put to working the handle of the cast-iron water pump on the back porch—which never could hold its prime. Gallons and gallons would be needed, for what, I don't know. And if it were Sunday our ice would be put to the best of all uses, the

Caroline Dormon communed with an old friend at her beloved home, Briarwood, in 1958.

These Dormon paintings illustrate her book *Flowers Native to the Deep South,* published in 1958. From left, they are: red flag (*Iris fulva),* yellow lady-slipper (*Cypripedium calceolus* var.

freezing of boiled-custard ice cream, with guess-who doing the cranking. "Don't turn it backwards—you'll unfreeze it!" Virginia would say, because that was what you said when you made ice cream.

After dinner Carrie would take us to see some exciting thing she had happened upon in the woods or brought in from elsewhere and caused to grow. She would lead, Indian file, warning of blossoms and plants which must not be bruised, and loudly lamenting the lack of rainfall or its excess.

Later, I would get my own private tour. Looking back, I think that Carrie's one regret about her way of life was that she could not pursue it and still teach school as she had once done. Now, reverting, she would be the teacher, speaking softly, revealing nature's shy secrets to the eager pupil.

It was she who taught me how to get at the nectar of honeysuckle by using the blossom as its own syringe. She led me to the only hummingbird nest I have ever seen. She showed me the cup in the larkspur blossom that precisely resembles the head of a rabbit. She let me experience the numbing tingle you get in your mouth from a sliver of bark from the tickle-tongue tree. She showed me the tiny cone-shaped crater which the doodlebug excavates in fine sand as a trap for small insects—and taught me how to tease its slope with a straw to fool the doodlebug into surfacing to see what's for dinner. She showed me that the mud houses built by dirt dauber wasps are full of dead spiders, like smokehouses with hams. We knelt to watch a tumblebug laboring uphill with its treasure-trove sphere of cow manure. She showed me Hezekiah, the big king snake, who patroled the place almost as a pet, protecting her from coral snakes and moccasins. And in the deepest part of the woods, in the spot she called The Dark Place, she tapped upon a devil's snuff-box—a desiccated pod of fungus—to expel its mysterious puff of brown spores.

On the occasions we spent the night, we'd have supper by lamplight and then sit out front on the porch steps, with a haze of wood smoke from the cookstove hanging blue in the clearing. The grown-ups would talk of people and ideas, of fun and sorrow—and looking back on it now, I know how much poorer the world is because people have forgotten how to converse.

Presently we would fall silent, to listen to the crickets and the tympanic basso of bullfrogs down at the pond. Hours later, I would lie under the ghostly shroud of a mosquito net and from far off hear the call of the whippoorwill, and then the cry of the owl.

There were many compartments in Carrie Dormon's life and I knew her in two of them. One was Briarwood. The other, 40 miles to the south, was Melrose Plantation. Carrie and my mother—whose short stories

pubescens), butterfly weed (*Asclepias tuberosa*), purple eryngo (*Eryngium leavenworthii*), pinewoods lily (*Eustylis purpurea*), Texas bluebell (*Eustoma russellianum*), scarlet gilia (*Gilia rubra*).

appeared regularly in those years in *Harper's, Atlantic Monthly* and *The Century Magazine* under her pen name Ada Jack Carver—had attended Judson College together in Marion, Alabama. Native Louisianians, they were among a colorful group of artists, writers, critics and the like who spent holidays or working sabbaticals at Melrose.

They came as the guests of the owner, Mrs. Cammie Garrett Henry, a widow whose impact upon art and letters was kinetic. Though wealthy, "Aunt Cammie" was not a formal "patroness" of the arts. She simply liked to surround herself with lively and creative people. It pleased her that the atmosphere of Melrose never failed to catalyze their talents.

At various times the regulars or frequent visitors at Melrose included, in addition to Carrie Dormon and my mother (who, and I shall always be grateful, usually took me along), such people as Rachel Field, Lyle Saxon, Roark Bradford, Gwen Bristow, Robert Tallant, Harnett Kane, James Register, Rose Franken and William Brown Meloney. Almost anyone might drop in unannounced, and people who later studied the guest book have been delighted to run across such names as John Steinbeck and William Faulkner.

Though no one required them to do so, the artists in residence considered it a point of honor to stay at their manuscripts and canvases in the cabins, outhouses and rooms provided by Aunt Cammie. In the evenings the dining hall in the antebellum mansion became a rollicking showplace.

Inevitably Aunt Cammie's long table gained a reputation as a sort of plantation counterpart of the late Frank Chase's Round Table in the Algonquin Hotel in New York. Not surprisingly, Alexander Woollcott, the perennial autocrat of Mr. Chase's table, became a now-and-then one at Aunt Cammie's. He was first lured to Melrose by his old friend François Mignon, who outdid Woollcott as the Man Who Came to Dinner. A Paris-born specialist in international law, Mignon had visited Melrose and been invited to stay on when Aunt Cammie learned that his career had been cut short by failing eyesight. He stayed 33 years and became the Boswell of Melrose.

Of all the regulars, no one struck brighter sparks than Carrie Dormon. There was always a new Dormon tale to tell. There was, for instance, the episode of the irises, which Mignon still chuckles over and will, I hope, include in his forthcoming volume of Melrose memoirs, *Plantation Memo.*

It seems that one of the group—very likely my mother—pulled in at Briarwood to invite Carrie to accompany her to Melrose for the afternoon. When they reached the plantation, Aunt Cammie's irises were at the peak of their glory. Carrie flew to the gardens and

began sketching and painting. Whoever had brought her recognized the signs, gave up and left.

At nightfall Carrie nibbled her supper as though in a trance and Aunt Cammie led her off to bed. Realizing that Carrie had not brought any luggage, Aunt Cammie provided toilet articles and sent a servant to gather her garments, launder them and return them during the night. Before daybreak Carrie bounced out of bed and at first light was back with the irises.

So it went, day after day, for almost a fortnight. Carrie was never aware of the nightly laundry service. Late one afternoon, as the irises were starting to fade, she announced she'd have to be getting on home because she had not planned on staying the night and had brought nothing to wear. No one bothered to tell her of the gap of almost two weeks in her life.

There was a sequel to the iris story, one preposterous for anyone in Carrie's more or less perpetual state of financial insolvency. A multimillionaire Texan saw one of the iris paintings and wanted more like it. He sent her a check—Mignon recalls it was for $3,000—as down-payment on a commission, promising to buy all the iris paintings she could produce. But Carrie had moved on to a new project, a children's book about local Indian tribes. "Oh, pshaw! I haven't got time to be bothered with *him!*" she said—and tore up the sizable check.

It delighted Carrie's colleagues that, like God, she could create fertile earth out of lifeless firmament and *command* green things to grow upon it. But she also had a low threshold of tolerance for human lunacy. She would rise in wrath, like a Biblical prophet, when her own or God's green handiwork—nowadays we would call it the environment—was being trampled upon or threatened by disinterest and neglect. Yet she could be a ruthless overseer of what she considered to be suitable ecological balances. She hated rabbits as nibblers of her wild irises and would shoot them on sight. When robins invaded she would call her friend Mrs. Sudie Lawton, who lives on a plantation near Melrose, to hurry to Briarwood and help fight them off, so that the resident birds would have enough to eat. "Stupid old robins!" Carrie would shout, flailing with a broom. "Go away!"

Though she and Virginia always owned a car—a roofless Model-T Ford two-seater in the years I knew them—Carrie regarded automobiles as personal affronts and fought against them. Sometimes the automobile fought back. On one visit to Briarwood, when I was four or five, I went with Virginia into Saline, maybe to pick up the inevitable block of ice. On the way back, as we jounced along the dirt lane, the hexnut of the steering column popped away and the wheel came off in her hands. I still have a frozen photographic memory of the astonished look on her face as she turned the detached wheel this way and that, trying to control the car. A moment later we careened into a pine tree.

Badly shaken but not hurt, we scrambled out to survey the damage. There was a crimp in the fender. The radiator had been caved in and water and steam were gushing out. But what appalled Virginia, and the only thing she bent over to inspect, was a gaping white wound, the size of a man's hat, on the tree. She made me help push the car back onto the lane and then some distance along it, until she could nudge the front end against *another* tree, to make it appear that the crash had taken place there. Then, before we walked to the clearing for help, we returned to the injured tree and covered the wound with fallen branches and pine straw—because Virginia was terrified of what her sister Carrie might say. . . .

"Somebody I know? Who?" said Carrie, as Mrs. Nichols gently turned her toward me. I told her. For a long moment she looked me over, warily. I could see her standing again in the leaf-mottled sunlight at the edge of the clearing, almost half a century ago. And then: "Well, land sakes! Look who's come, May. Look who's come to see the old scarecrow!"

She knew and I knew that there would be no future to this encounter. But we played out the charade. One day soon I would meet her at Briarwood. Together we would prepare a magazine article. We would stroll along the lane and down to the pond. There would be new secrets to be shared.

Late in her life, Carrie and her collie strolled the lane, sun-dappled as when the author's car navigated it.

More than 500 industrial archaeology enthusiasts helped clear the Kennet and Avon Canal.

By Anne Angus

The fascinations of discovering engineering's past

A new kind of 'archaeologist' seeks historical insights and nostalgic pleasures among the relics of Britain's Industrial Revolution

An 18th-century engineering achievement: a flight of five locks on the Leeds and Liverpool Canal rises 60 feet in less than 150 yards.

Color photographs by Terence Spencer

The British, by reputation, can develop a nostalgia and enthusiasm for almost anything. One rainy weekend not long ago, volunteers (see above) from throughout England gathered in the muck and refuse of a long unused canal for a serious purpose. They cleared 200 truckloads of rubbish from a two-mile stretch that included ten locks, making the canal ready for final restoration by professional engineers working under the aegis of the Inland Waterways Commission.

This was no ordinary canal; it was the Kennet and Avon Canal, built in 1810 by the brilliant civil engineer John Rennie. Though narrow, it carried a great deal of traffic and was a vital east-west link in southern England at a time when the landscape of the British Isles was being made over not by architects and gardeners but by entrepreneurs.

To the north, another canal winds 200 tortuous miles from Leeds up over England's high central ridge to the seaport of Liverpool. Begun in 1770, it took 50 years to complete and required such engineering features as the Bingley Five Rise Locks (shown at left). This was yet another link in the 4,250 miles of canals built between 1760 and 1860 to serve the burgeoning manufacturing might of Great Britain. It is a monument to the "we-can-do-anything" mood of the Indus-

The "Stonehenge of industrial archaeology," this 1779 bridge stretches 100 feet across the Severn.

Built in 1805, the Pont Cysylltau Aqueduct extends a canal 1,000 feet across a Welsh valley.

trial Revolution, a period of especial vitality that now strongly beckons to modern Englishmen.

Today the British Waterways Board keeps the Leeds and Liverpool Canal open—at a loss—and coal barges still ply its western end, but more and more it is a place of recreation. Among the picnickers, scores of amateur historians note the fine engineering points along the way as they cruise the channel at the leisurely pace of the era this canal was built to serve.

Indeed, in the last 20 years many Britons have become immersed in the artifacts of their early industry and commerce. Two thousand at a time will line up to see and hear a primitive steam engine when it is going to be fired. Impelled by the bulldozer's progress, thousands of enthusiasts comb the countryside and the edges of towns for relics of the Industrial Revolution—documenting, photographing, restoring and preserving wherever possible.

There is more to it than nostalgia and the worship of fine old machinery. A new scholarly discipline has arisen from the relics. The local amateurs frequently work under the direction of a growing handful of professionals. These are known as "industrial archaeologists," because they have turned from the usual written sources of the historian and, like archaeologists, have taken to the field to see what new perspectives on Britain's economic and social past can be gleaned from actual artifacts. They have abandoned their books for their boots.

Industrial archaeology has recently become a recognized field of study for the Royal Institute of British Architects. The National Trust, which historically has spent much of its energies on the preservation of more traditional monuments and buildings, now finds itself engaged with increasing vigor in the restoration of old factories and windmills. (It is perhaps appropriate that this movement began in Great Britain, for it is there that the Industrial Revolution had its beginnings. More recently, the subject has taken root in the United States. Last fall the Society for Industrial Archeology was formed through the instigation of various interested individuals, including Robert Vogel, the curator of the Division of Mechanical and Civil Engineering at the Smithsonian Institution. Its first annual meeting will be held in April 1972.)

Though inchoate, the field has already identified some heroes and some classic artifacts. And from these have come some insights. For example, among efforts to "level" the British countryside with locks over hills, aqueducts over valleys and boat lifts from one waterway to another, one engineering marvel is the 1,000-foot-long Pont Cysylltau Aqueduct near Llangollen in Wales. Built from 1795 to 1805 by Thomas Telford, it is a thing of simple beauty with its 18 masonry piers and iron trunk still in perfect condition, and one of several meccas for the industrial archaeologist. It is also a towering reminder that the real birth of capitalism may have coincided with the canal era when subscriptions for shares were made up among all kinds of people to bear the enormous capital expenditures of building England's waterways.

If canals were the blood vessels of the early Industrial Revolution, then iron was its protein. Perhaps *the* classic structure of the era is the Iron Bridge (facing page, above) built across the Severn River in Telford, Shropshire, by an iron smelter named Abraham Darby in 1779. The first such structure in the world, every piece of its 378 tons of iron is dovetailed like timber: There are no bolts or screws.

Few such bridges were built. The pace of design picked up rapidly and bridges soon became far more delicate and economical in their use of metal. In places like Bath and Southwick, one can see 19th-century ancestors of the Golden Gate bridge. Not only did the Iron Bridge help to revolutionize bridge building and transport, it showed 18th-century engineers the vast possibilities of using cast iron as a building material.

In 1784 the first iron boat was launched. Before the end of the century the master engineer, Thomas Telford, had applied cast iron to the construction of canal aqueducts; a metal-framed building had been erected, the ancestor of every skyscraper; and central heating had been introduced by running steam through hollow iron columns. It was, as some have called it, the second Iron Age, and it lasted until 1859 and the in-

A later development, the Anderton boat lift still raises yachts 50 feet from one canal to another.

Anne Angus reported on science in Britain's open classrooms in the July issue of SMITHSONIAN.

vention of the Bessemer process for the large-scale production of cheap steel.

We often think that the Industrial Revolution occurred almost overnight, that suddenly, on the shoulders of a few inventive giants like Arkwright and Watt, Britain leapt from an age of rural craftsmen into an age of factory production. Students of bridges and canals know better. So do the visitors—30,000 a year—who tramp through the insides of the Bembridge Windmill on the Isle of Wight. Built about 1700, it has wooden gearing made from local oak, the teeth from applewood and beech (see right). It is not a product of standardized designs as were later mills, but a transitional step toward the Industrial Revolution. Now a property of the National Trust, the mill ground grain until 1913; its wooden wheels are turned four times a year lest the force of gravity cause the machinery to sag.

The local antiquarian may take his pleasure from documenting the small, ingenious advances made by a local engineer. "His" windmill or factory is unique. The professionals' task is to fit all these unique designs into a pattern and the pattern is one of evolution.

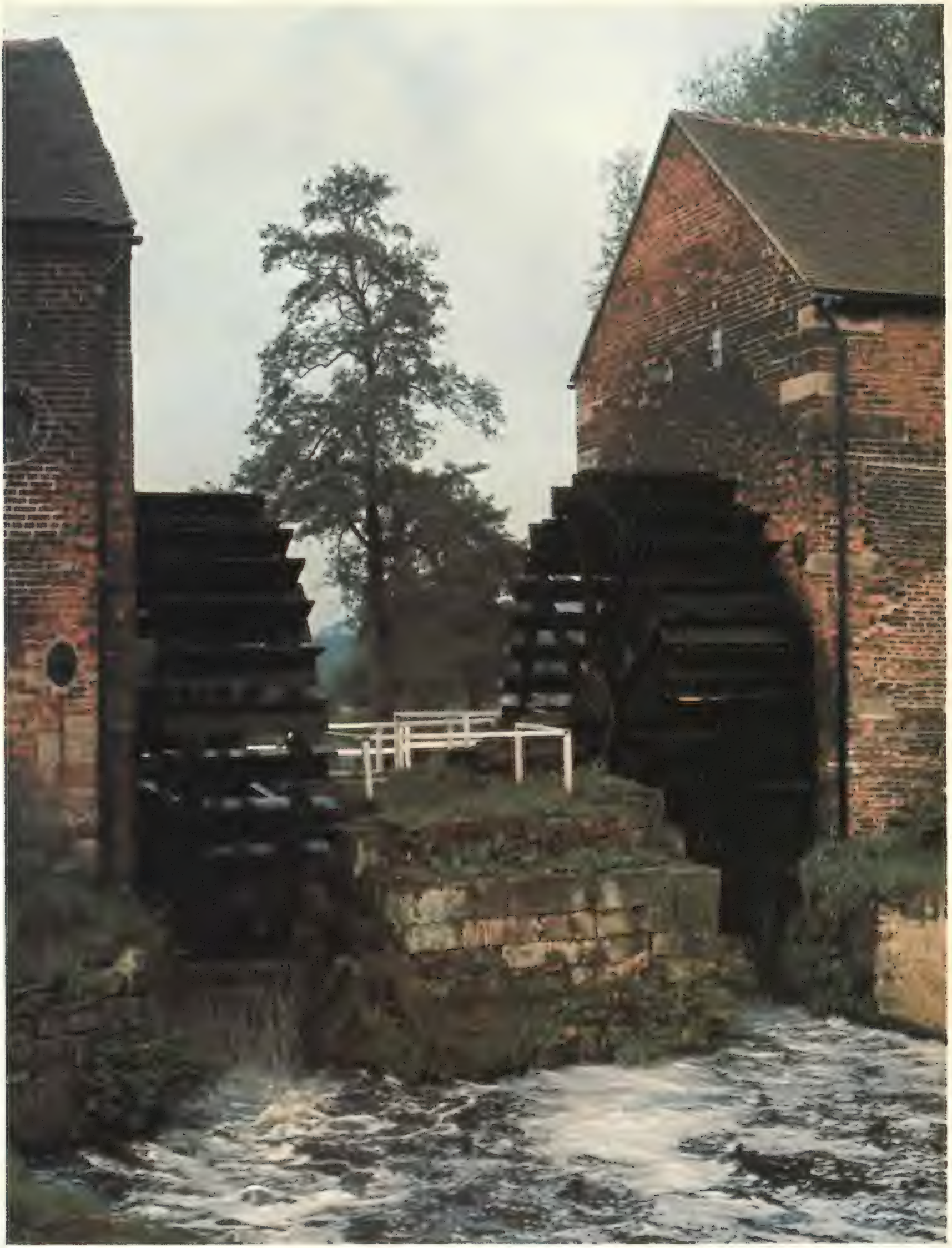
Manufacturing processes required power, and individual engineers made a host of small and large improvements in the techniques of harnessing wind and water. For example, John Smeaton is often credited with the invention of the overshot wheel; in fact he merely put on paper and preached abroad the ideas of the many millwrights who for centuries had observed that a wheel operated by falling water was more efficient than a wheel driven by water flowing horizontally against its lower paddles.

The Cheddleton Mill in Staffordshire (facing page) is an example of early industrial evolution. Converted from a grain mill around 1729, it has two undershot wheels that were used in grinding flint, a process necessary to the pottery industry nearby. (Along with textiles, pottery was a main force in British industrialization.) The interesting thing about the Cheddleton Mill, aside from the marvelous sight of its two great wheels working and splashing side by side, is the example it provides of the gradual development of an industrial enterprise. The first mill was built by a Thomas Benson who was granted a series of patents on flint-grinding. When he succeeded, the second mill was built from 1756 to 1765 by James Brindley. Both mills worked until 1963 and four years later local enthusiasts formed a trust for their preservation.

All of these wheels, processes and transport works developed step-by-step in the hands of patient engineers. "They didn't invent anything," says one British expert. "They were improving all the time."

There were, of course, technological breakthroughs. Steam power eventually replaced wind and water, just as later in the 19th century railroads took over much of the canal traffic. But industrial archaeologists and

The wooden gears of the Bembridge windmill were a transition to the Industrial Revolution's iron.



Products of the "second Iron Age," the 18th-century Cheddleton Mill's twin iron wheels still turn.

other scholars have perceived that the early demand for steam power arose entirely from the need to drain mines and operate canals rather than from manufacturing requirements. When John Rennie built the Kennet and Avon Canal he installed a pair of Boulton and Watt steam engines (right, above and below) to pump water into a waterless 20-mile stretch.

The engines operated until the 1950s and one has now been lovingly restored to working order by volunteers. It is thought to be the oldest operating steam engine in the world. As L. T. C. Rolt, a distinguished author on the history of technology, has written: "Until you have seen and heard one of these huge engines at work it is impossible to appreciate their majesty fully. As the great beam rocks to and fro in its trunnions high overhead, the down plunge of the piston rod and the polished geometry of the Watt linkage, in the poetry of their mechanical motion, seem the most perfect expression of controlled power."

An almost equal delight can be found in tracing the history of early factories, some of which are still in operation, such as the Whitchurch silk factory (facing page), which makes a tenuous living producing silk thread on its elderly equipment.

These factories, of course, were the forerunners of William Blake's "dark Satanic mills." The machinery that engages today's scholars is the same equipment that brought the Luddites, rebellious wreckers of machines, snarling into existence. But it is also the machinery that brought Western civilization far into the industrialized era we have not yet left.

And in an era when men are dwarfed by truly gigantic machines, and when mammoth engineering projects are organized by nameless teams, there is good cause to admire these early artifacts of the Industrial Revolution, their distinctly personal origins and their raw beauty.

Volunteers have restored the Lancashire boiler of the Crofton pumping station to working order.

The cylinder of the Crofton engine, the oldest operable steam pumping engine in the world.

The Whitchurch silk factory evolved from grinding grain to making textiles and still makes thread.

HOW ALUMINUM CAN HELP PAY OUR $5 BILLION GARBAGE BILL.

Aluminum's high scrap value can be used to reduce the size and cost of our national waste pile. Reynolds has already started the job.

In 1967, Americans generated enough garbage to cover half the state of Connecticut with a foot-deep layer. It costs some of our large cities nearly a half million dollars a day *to dispose of their refuse. The pile gets bigger year after year, and we're fast running out of places to put it.*

Looking at facts like these, Reynolds Metals Company launched a program several years ago to salvage used aluminum cans and other aluminum household scrap—even though aluminum accounts for less than ½ of 1% of the nation's garbage.

The idea was to pay people or groups 10¢ per pound for aluminum which they bring to Reynolds reclamation centers. There, the scrap

is processed and shipped to other Reynolds facilities where it is "recycled" back into usable aluminum sheet, plate or other mill products.

Reynolds helps put "recycling" into the ecology dictionary.

Reynolds recycling program helps do two important jobs: It conserves valuable national resources, and helps with our litter and solid waste disposal problems.

One of Reynolds Mobile Reclamation Units to aid collection of all-aluminum cans.

The program is working: The aluminum industry has recycled over a billion cans, three-fourths of which were recycled in 1971 alone. More than $4.3 million were paid to the American consumer for this metal—with no municipal disposal cost.

Reynolds now operates 13 permanent reclamation plants and 11 mobile collection units. In addition, other leading companies, chiefly beverage manufacturers and distributors, are working with us in this effort to pick up and recycle every possible pound of household scrap aluminum. Today, there is a network of more than 633 satellite centers in 31 states.

Some of the companies working with Reynolds in collecting and recycling aluminum cans.

Adolph Coors Company
Anheuser-Busch, Inc.
P. Ballantine & Sons
Blitz-Weinhard Company
Carling Brewing Company
Falstaff Brewing Corporation
Jos. Schlitz Brewing Company
Theo. Hamm Company
Miller Brewing Company
Mobil Oil Corp.
Olympia Brewing Company
Pepsi-Cola Company
Piel Bros., Inc.
Rainier Brewing Company
The Coca-Cola Company
Union Oil Co. of California

What makes the effort work is the basic value of aluminum. Scrap aluminum is worth $200 a ton; other common packaging materials are worth only $16 to $20 a ton.

Because of this, we feel our can collection program is just the start of much larger and more effective attacks on the nation's solid waste disposal problem.

Aluminum's value can help pay for the recycling of much of the solid waste this country generates. Here, for example, are a few of the approaches Reynolds is involved in:

Will the homemaker separate?

If housewives would separate recyclable materials from the rest of their daily trash, municipal refuse disposal costs would be greatly reduced, and recycling could be that much easier. It is estimated that if 1,000 households separated waste paper, aluminum cans, and glass bottles for recycling programs rather than throwing them away, a community could save over $50,000 in a year.

• Reynolds is now working with communities in Florida and California, providing free plastic bags to encourage household separation of waste. The goal is to see if the value of the aluminum will pay for part of the collection service.

Working with B.I.R.P. and cities.

• In Phoenix, Reynolds is part of the Beverage Industry Recycling Program (B.I.R.P.), helping to operate a model facility that is recycling aluminum, glass, and steel.

• We're talking with school systems about plans to collect used aluminum containers and foil from their cafeterias, the proceeds to help pay for school operations.

• In the San Francisco area, we're one of nine companies and municipalities planning a new, sophisticated reclamation plant. Here, aluminum, steel, paper, and glass raw materials will be separated automatically from mixed municipal garbage.

• Through the Aluminum Association, we've helped develop plans for garbage processing plants that could help pay for themselves by recovering aluminum and other raw materials. They would also produce valuable chemicals, fertilizers, animal feeds, and steam power.

Garbage in. Valuable raw materials out.

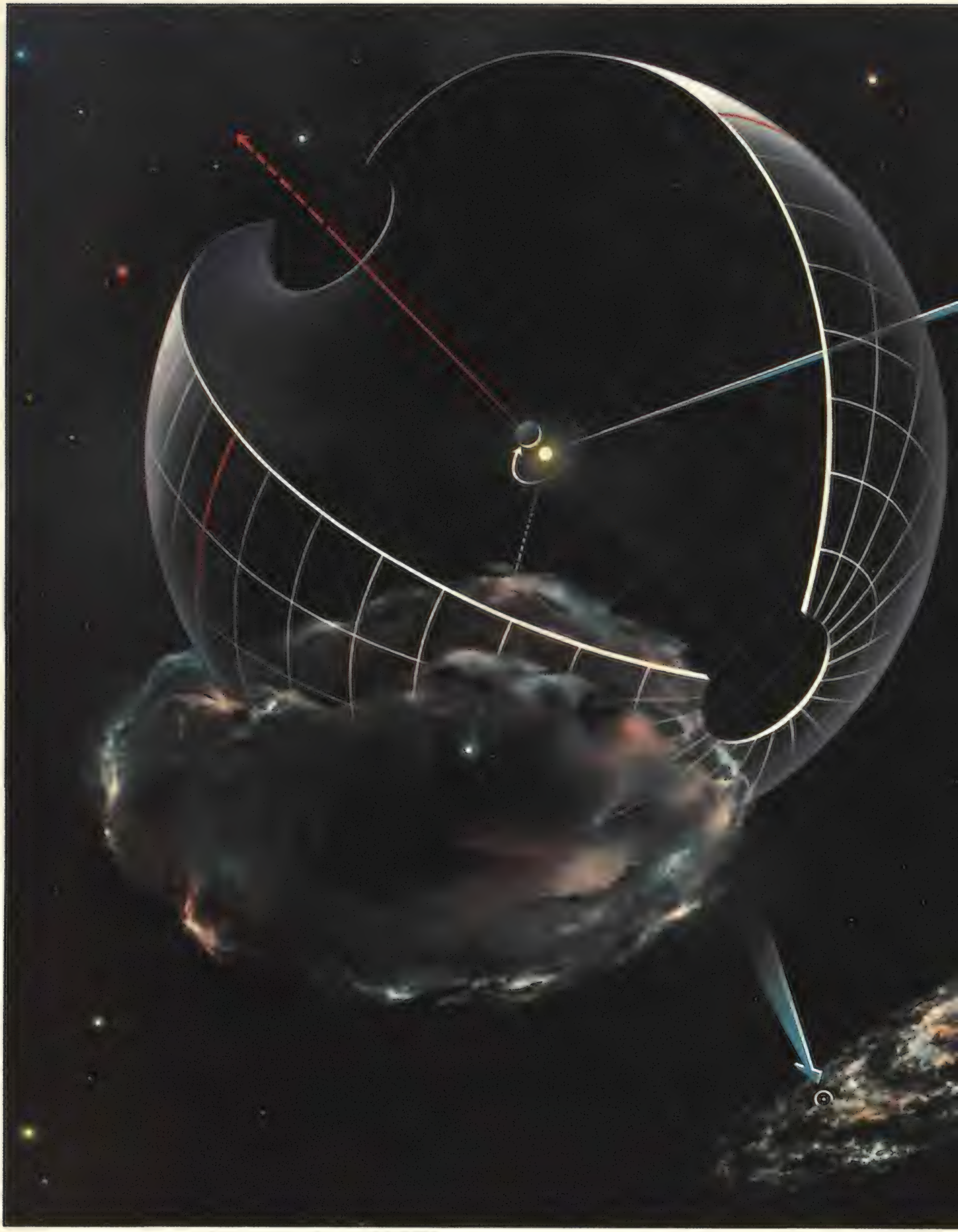
Recycling Plant

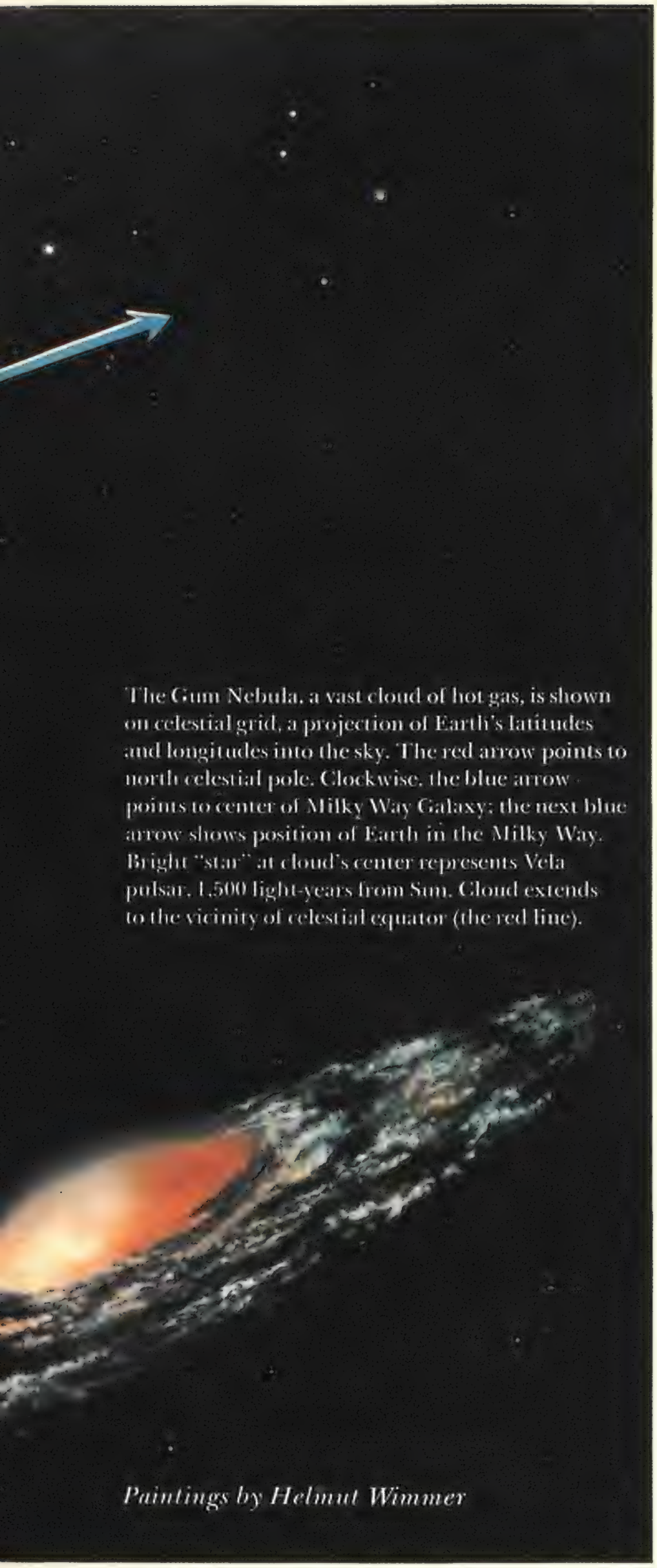
Non-Ferrous Metals	Aluminum Copper Zinc
Ferrous Metals	New Iron & Steel products Scrap for use in copper industry
Food Waste, Sewage, Sludge	Soil Conditioners Organic Fertilizer
Contaminated Paper, Plastics	Fuel for generating steam & electricity
Pure Paper	New Paper Products
Glass	Paving Material Bricks, Block, Structural Shapes

The American standard of living is creating a garbage pile that is now a national problem. But the value of aluminum in the garbage could turn this national problem into a national asset. *To learn more about what Reynolds is doing, write Dr. Robert F. Testin, Director of Environmental Planning, Reynolds Metals Company, P.O. Box 27003-LMM, Richmond, Va. 23261. The men and women at Reynolds are always interested in your comments and suggestions.*

recyclable aluminum

REYNOLDS
where new ideas take shape in
ALUMINUM





The Gum Nebula, a vast cloud of hot gas, is shown on celestial grid, a projection of Earth's latitudes and longitudes into the sky. The red arrow points to north celestial pole. Clockwise, the blue arrow points to center of Milky Way Galaxy; the next blue arrow shows position of Earth in the Milky Way. Bright "star" at cloud's center represents Vela pulsar, 1,500 light-years from Sun. Cloud extends to the vicinity of celestial equator (the red line).

Paintings by Helmut Wimmer

By John C. Brandt and Theodore P. Stecher

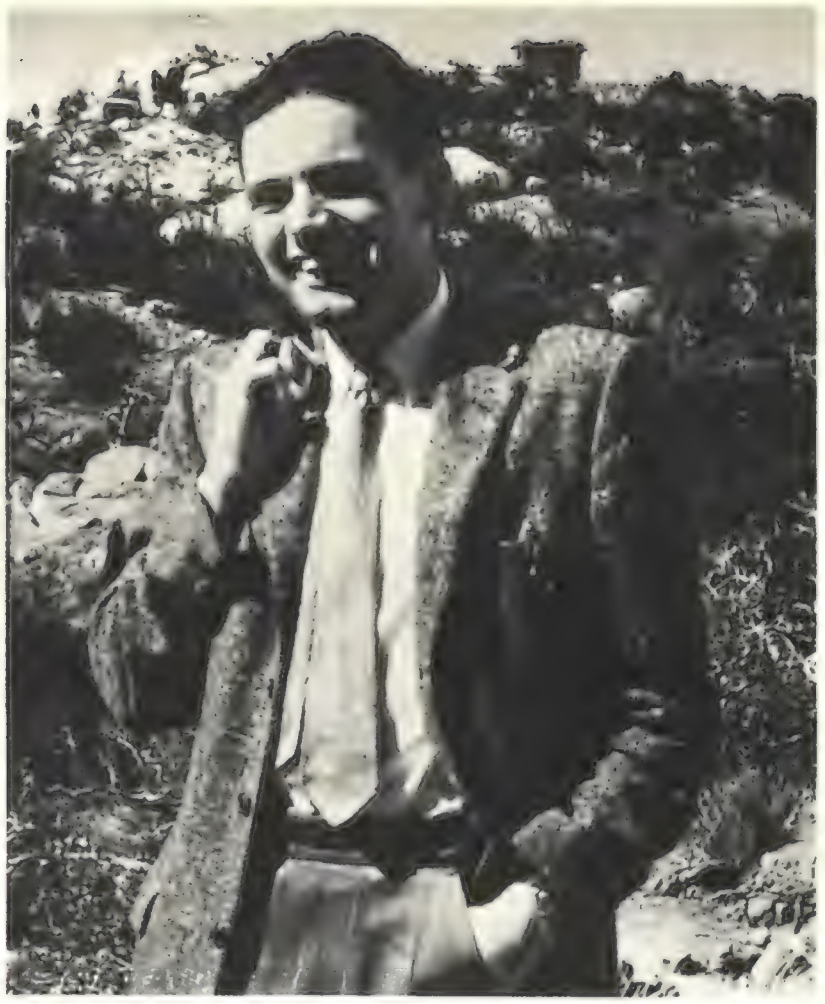
An invisible cloud, the huge result from a huge bang

It escaped astronomers for years; the Gum Nebula came to be when a star collapsed with a brilliant flash of light 9,000 years ago.

Looming over the southern skies is a huge cloud of hot gas. Not only can northerners not see it; neither can citizens of the Southern Hemisphere, since it is invisible. Nonetheless it extends over a considerable fraction of the sky and is one of the largest "objects" in the Milky Way Galaxy. Indeed the cloud is so large that even with their sophisticated equipment astronomers, who are simply not accustomed to searching for celestial objects this big, never noticed it until 1952. And only in recent months have we determined what this enormous cloud is and how it was born from an enormous celestial explosion.

For decades astronomers have known that the Galaxy was populated not only by stars but dense clouds of gas called nebulae. Some nebulae are found in the regions where stars are forming, while others are born when huge stars collapse, ejecting particles of matter in a glowing, expanding cloud. These nebulae are for the most part relatively localized phenomena: For example, the Orion Nebula, a region of young stars, is about 15 light-years across, quite small compared to the Milky Way Galaxy which is 100,000 light-years across. The Crab Nebula, a region of star collapse and ejected matter (see SMITHSONIAN, June 1970), is only six light-years in diameter.

John C. Brandt is the author of a recent book, The Solar Wind; *his co-author, Theodore P. Stecher, is presently a Visiting Fellow at the Joint Institute for Laboratory Astrophysics in Boulder, Colorado.*



In 1960, the year he died at 36, Colin S. Gum, first to survey the nebula now named for him, visited Kitt Peak observatory (under construction on hill).

Nor do these nebulae and stars inhabit vast stretches of empty space: Astronomers have gradually accumulated evidence of a thin interstellar gas throughout space consisting mostly of hydrogen atoms. This interstellar gas is, generally speaking, of two kinds—neutral or ionized.

Most of the interstellar gas is neutral, just as most of the matter encountered in our everyday existence is neutral—meaning that each atom has the same number of negatively charged electrons in orbit around the nucleus as it does positively charged protons in the nucleus. But when atoms are heated, for example by shining ultraviolet light on them, some electrons can be knocked out of their orbit. The result is atoms with unequal numbers of electrons and protons; the electrical charges do not balance and the atoms are said to be *ionized.*

Since ionized gases are usually (though not always) produced by applying heat, they are often called "hot." Astronomers call regions of neutral interstellar gas H I; regions of ionized or hot gas are called H II. The enormous cloud in the Southern Hemisphere's sky is an H II region.

Why are some regions neutral while others are ionized? Most large ionized regions in space are thought to be of a type first described by the distinguished Scandinavian astronomer, Bengt Strömgren, in 1939. Called Strömgren spheres, they are carved out of the neutral interstellar gas by the ultraviolet light from hot, bright stars. The light does not push the interstellar gas away from the stars, but simply changes the state of the gas from neutral to ionized. How big such an ionized region is depends on the temperature and size of the star as well as on the amount, or density, of the surrounding interstellar gas.

In 1952, the late Colin S. Gum, an Australian astronomer, reported a huge H II region in the Southern Hemisphere; his discovery was received with mild but not exceptional interest. Gum's observations were in the form of photographs taken with filters which isolated a particular wavelength of red light called hydrogen-alpha. This light is a sensitive indicator of hot hydrogen in space.

The region Gum charted took up an area of the sky 20 degrees by 20 degrees. (By way of comparison the Crab Nebula, for example, takes up an area 0.1 degrees by 0.05 degrees.) As Gum made additional observations, the cloud "grew"; in 1955 he had charted the cloud in an area 40 degrees by 30 degrees, and in 1956, 60 degrees by 30 degrees.

Gum suggested that his cloud was a Strömgren sphere, produced by two hot, bright stars known as gamma Velorum and zeta Puppis, which are located in the constellation Vela. He was impressed by the huge size of the cloud and wrote: "Obviously the sun is near to the borders of the H II region, and may even be just inside it. . . ." In 1960 Gum died in a skiing accident and it was only later that the question of whether or not the sun was located in ionized gas or neutral gas became important to astronomers, so Gum's cloud went unstudied for several years.

Meanwhile, in the late 1950s and especially in the

Glossary of terms for nebula observers

Electron: one of three fundamental particles (with neutron and proton) making up atoms. It has a negative charge and orbits in the outer part which contains almost all the volume of an atom but only a tiny fraction of its mass.

H I region: an area in which the thin interstellar gas, which is made up mostly of hydrogen atoms, is neutral; that is, each hydrogen atom has one electron and one proton and, thus, its electrical charges cancel out.

H II region: an area of interstellar gas where many of the hydrogen atoms have lost their electrons owing to a process of ionization. Also called an ionized or "hot" region.

Ionization: the process in which a hydrogen atom's electron is knocked out of orbit, leaving the atom electrically charged. When a hydrogen atom, which consists of only one electron and one proton, is ionized, only the proton remains.

Light-year: the distance through which light, moving through empty space at 186,000 miles per second, travels in a year—5,878 billion miles.

Nebula: a gas-and-dust cloud in the heavens. A few are bright enough to be seen as fuzzy stars by the unaided eye; some are dark and observable only as black patches against a starry background. The vast and tenuous Gum Nebula can be "seen" only by recording a particular wavelength of light that indicates ionized hydrogen.

Neutron: one of three fundamental particles (with electron and proton) of which atoms are made. It has no charge and occurs in the nucleus.

Neutron star: a star in which gravity has compressed all matter into a volume so tiny that the atoms have been crushed and made into neutrons.

Power of ten: a convenient notation for handling huge numbers. For example, 10^4 is the same as $10 \times 10 \times 10 \times 10$, or 10,000. 5×10^4 is 50,000. To express the amount of energy needed to create the Gum Nebula without using powers of ten would take almost two lines of zeroes.

Proton: one of three fundamental particles (with electron and neutron) of which atoms are made. It has a positive electric charge and is a constituent of the nucleus.

Pulsar: an object in the heavens that emits pulses of radiation at a regular rate between 30 times a second and once every 3.7 seconds. Only recently discovered, they have been identified as neutron stars. The rate of the pulses depends on the rate at which the neutron star spins.

Supernova: a star in the act of a great explosion that follows the exhaustion of its nuclear fuel.

early Sixties, through experiments on orbiting spacecrafts, astronomers discovered that the sun continuously emits matter in the form of electrons and protons. This "solar wind," as it is called, streams out into space affecting not only the Earth's magnetic field but other phenomena such as comets.

Presumably the solar wind also interacts with the interstellar gas near the sun and several astronomers (one of the present authors included) began to look for the effects of this presumed interaction. In particular, we had to find out the distance at which the solar wind stopped streaming away from the sun and merged with the atoms of interstellar gas. This required that we find out what kind of interstellar gas the solar wind reacts with—that is, is the solar system located in neutral or ionized gas? This, in turn, led us back to Gum's ionized cloud.

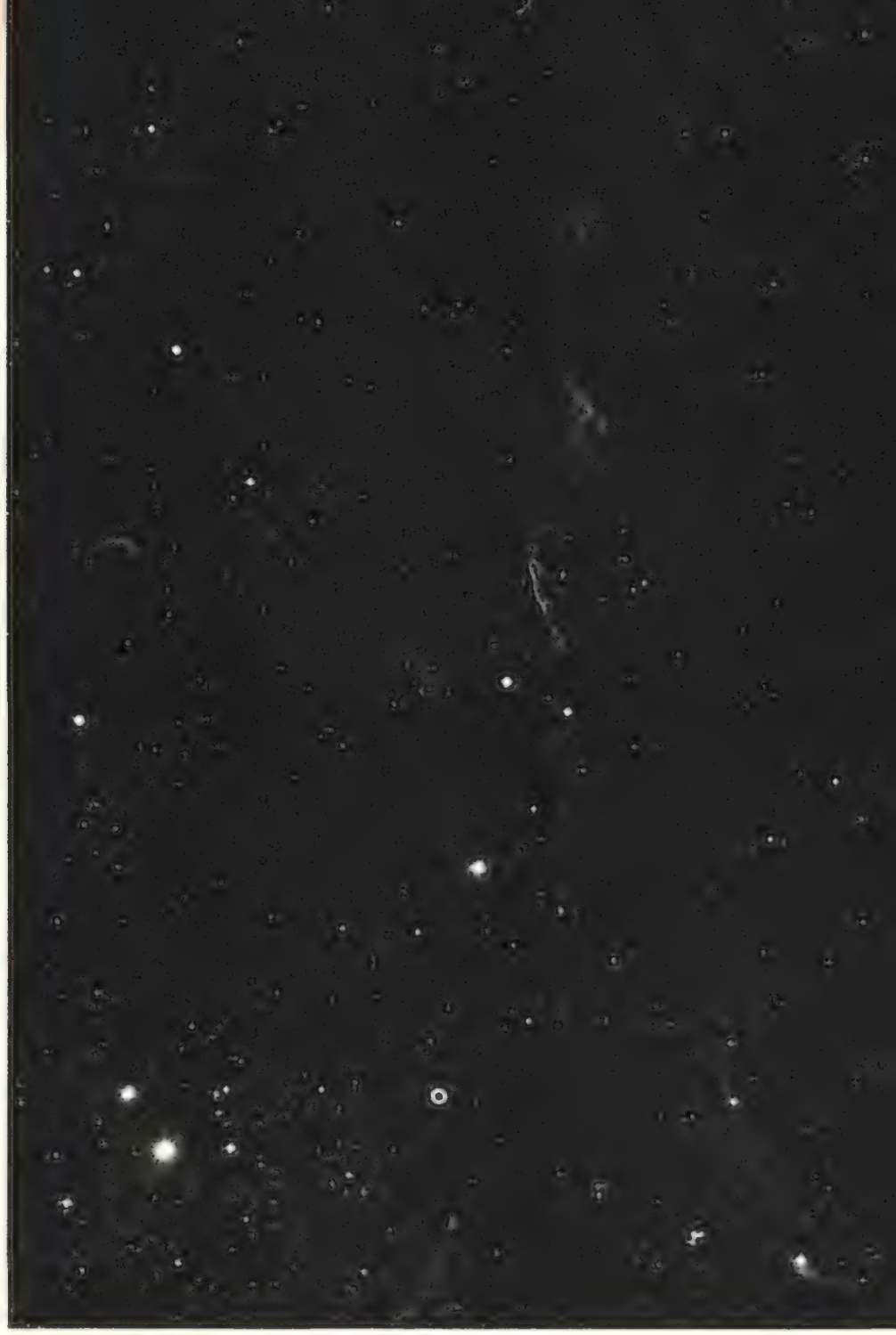
Indeed, our first question was: Does the cloud reach the sun? A group of scientists including the present writers and their collaborators, Stephen P. Maran, David L. Crawford and Joseph K. Alexander, felt that the question could be answered if we could determine first, how far the cloud's center is from the sun and, second, how big its radius is. Gum believed that his cloud was a Strömgren sphere powered in part by the star gamma Velorum, which is located at the approximate center of the sphere.

This star has a companion star of a kind that astronomers call type B. The *intrinsic* brightness of this kind of star is known. But the farther away from us a star is, the less bright it *appears* in the sky, so by comparing a star's intrinsic brightness by type with its carefully determined "sky" or apparent brightness, we can easily calculate the star's distance from Earth. While these necessary observations were underway at the Cerro Tololo Inter-American Observatory near La Serena, Chile, a small group of B stars in the vicinity of gamma Velorum was noticed by David Crawford. The average distance of nine of these stars turned out to be 1,500 light-years.

When astronomers begin looking for one thing, they often find another. In 1968, a pulsar, called the Vela pulsar, was discovered by M. I. Large, A. E. Vaughan and B. Y. Mills in the direction of Gum's cloud. Pulsars are neutron stars with "searchlight beams" of light or radio waves which sweep around as the star rotates on its axis. Such neutron stars occur when a star's nuclear fuel is exhausted and it explodes—an event called a supernova. At the same time that great quantities of matter are thrown off in the outburst, the central part of the star is compressed into a rapidly spinning neutron star—a pulsar.

Surrounding the Vela pulsar, astronomers found the remnant of the supernova, a glowing cloud. The rem-

The Gum Nebula



At the cloud's center are remnants of a big bang: The bright filaments are matter ejected

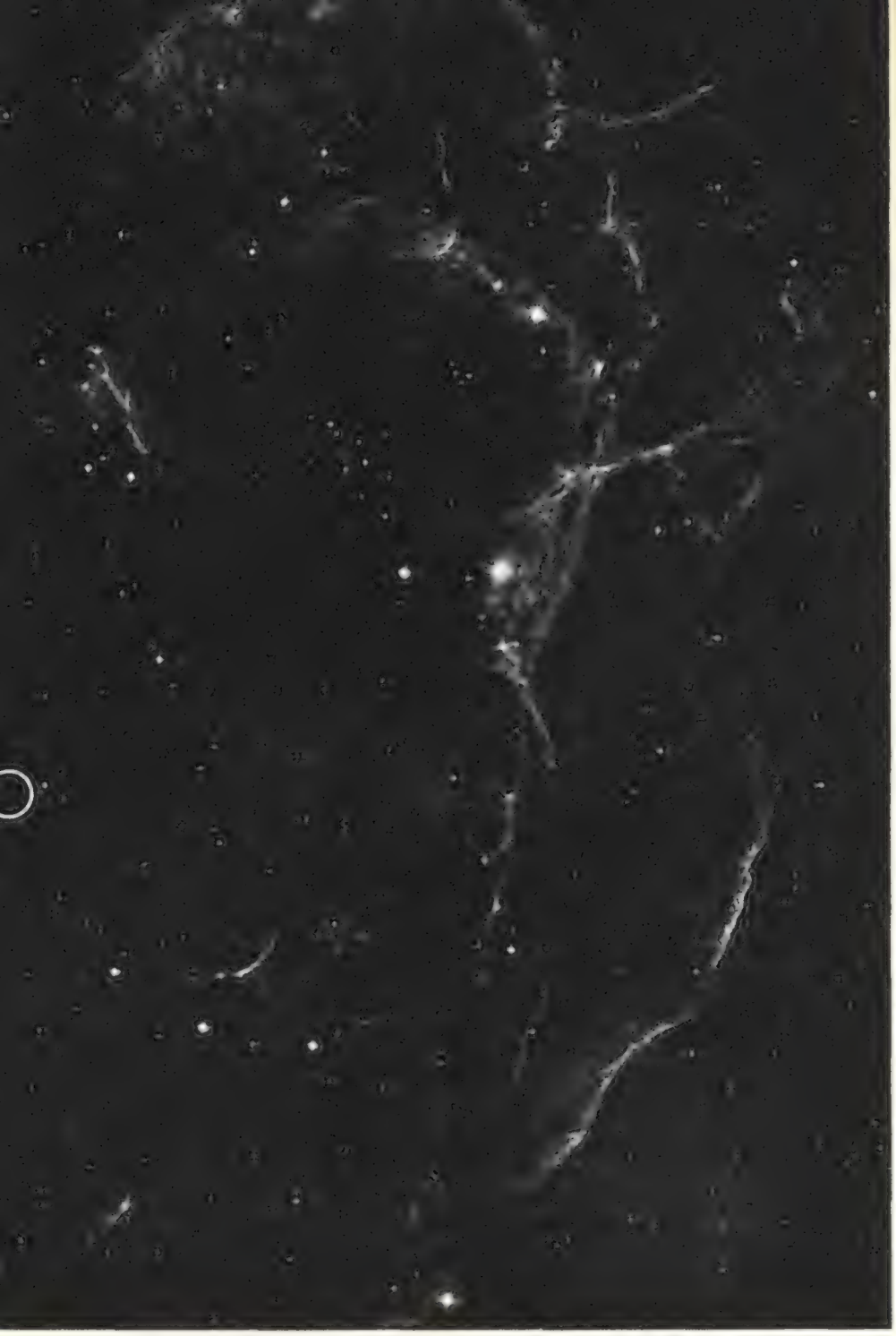
nant proved to be roughly the same distance from Earth as the star gamma Velorum, meaning therefore that both the pulsar and the supernova remnant lie in the central part of the huge cloud of hot gas along with the type B stars whose distance from Earth we had found. Knowing this, we could make some additional calculations that permitted a broad physical description of the cloud, and allowed us to determine if indeed the sun lay in its outer reaches.

Pulsars emit pulses of all radio frequencies at the same instant, but the speed of radio waves is known to depend, from frequency to frequency, on the abundance of electrons through which the waves pass. Hence, each frequency from the pulsar arrives on Earth at a slightly different time, depending on the amount of electrons in their path through space. So, by timing the arrival of the various frequencies, we could find the total number of electrons in the path from us to the Vela pulsar.

Also, a certain wavelength in the ultraviolet spectrum is absorbed by neutral hydrogen atoms and, by means of rocket-borne instruments (necessary because this wavelength is absorbed altogether by the Earth's atmosphere), it was possible to estimate the number of neutral hydrogen atoms between the Earth and the two stars, gamma Velorum and zeta Puppis. In addition, we could determine the amount of electrons and protons from the brightness of hydrogen-alpha (red light). Finally, thanks to the work of radio astronomers, we have a good idea of the normal density of neutral hydrogen near the sun.

From all of these data, and with some common sense, we constructed a working picture of Gum's cloud. The present model shows an ionized cloud of varying density with a radius of 1,200 light-years (that is 160 times wider than the Orion Nebula). The sun is not in the cloud: It is 300 light-years away from its edge. Thus we knew then that the solar wind flows away from the sun through neutral, not ionized gas. But that still left a huge cloud of ionized gas out there—a cloud even larger than Gum believed it to be. Though the cloud had answered our original question about the solar wind, we remained curious about the cloud itself. What is it? How did it come about?

Early in these studies of Gum's cloud it had become apparent that the two stars, gamma Velorum and zeta Puppis, were incapable of ionizing the interstellar gas all the way to the solar system. In fact, they were found to be incapable by a large factor of even maintaining the cloud, given the dimensions that had been discovered for it. Even a generous estimate of the ionizing power of these stars indicates that *at least* ten times their ionizing power was needed to maintain the cloud. Since there are no other stars in this part of the Galaxy that could make a substantial contribution to the ionization, we found ourselves in the position of hav-



in a supernova explosion that also left Vela pulsar (in area of the circle) beaming radio waves into space.

ing the largest known ionized region in our Galaxy *with no source of ionization to maintain it.*

Could a single event long in the past have generated sufficient power to create it? We had found that the total number of electrons in the cloud (expressed in powers of ten) was 2×10^{62}, and we can calculate how much energy would have been necessary to ionize the region in one stroke. The energy needed to knock off that many electrons from hydrogen atoms is 5×10^{51} ergs, an amount of energy totally incomprehensible in terms of our everyday experience. If we raise the temperature of one cubic centimeter of water by 1.8 degrees F., we expend 4×10^{7} ergs or 1 calorie. Even one kiloton of TNT releases "only" 4×10^{19} ergs.

Five $\times$ 10^{51} ergs is the total energy that would be emitted by the sun at its present rate in 100 billion years. The universe is estimated at only ten billion years in age, the sun at five billion. Furthermore, not all forms of energy can ionize hydrogen atoms; it is primarily extreme ultraviolet light that can do it, and this constitutes only a minuscule fraction of the sun's radiant energy. Whatever ionized Gum's cloud had to be a truly enormous event.

Before the current research into Gum's huge cloud, two MIT astrophysicists, Philip Morrison and Leo Sartori, had calculated how much energy in the form of extreme ultraviolet photons is emitted from supernovae, those explosions of collapsing stars that are often so bright that they outshine an entire galaxy. The amount of energy is sufficient to have ionized the region of Gum's cloud.

The Vela pulsar, as was noted before, is thought to be evidence of a supernova outburst in the center of the hot cloud, and indeed optical and other observations showed the remnants of a supernova. The best explanation was that the huge cloud in the Southern Hemisphere is a vast, tenuous nebula, the aged "fingerprint"of a prior supernova. Accordingly, the cloud is now called the Gum Nebula. The next question confronting us was how aged is this fingerprint. When did the supernova occur?

The pulsar to the rescue

Again, the pulsar in its center is a useful object. Not only had it permitted the calculation of the nebula's electron density, but it provides us with a kind of clock for determining the approximate date of the supernova outburst. The pulses of pulsars are thought to result from the searchlight beam of the rapidly spinning neutron star sweeping past the Earth. In the case of the Vela pulsar, this is approximately 11 times per second. Precise timing shows that the interval between pulses is very slowly lengthening, and from the rate at which the pulsar is slowing down we can calculate its age. It turns out to be 11,000 years.

It appears then that the following events took place some time near 9000 B.C. In the constellation Vela, there was a bright supernova outburst which must have been visible from Earth. The star which blew up threw off the presently observed remnant and as the star collapsed (or imploded) it produced the dense, rapidly rotating neutron star we now know to be a pulsar. At the same time, a tremendous flash of ultraviolet photons was emitted, ionizing the entire region we now see as the Gum Nebula. The material ionized by the flash was not the material ejected by the supernova but the pre-existing interstellar neutral hydrogen.

The ionization was not instantaneous; the cloud did not come into being all at once. For even at the speed of 186,000 miles per second (the speed of light) it took 1,200 years for the ionizing ultraviolet light to travel from the center of the supernova to the present edge of the Gum Nebula. Because the Gum Nebula is an

ionized region whose source of ionization has long since vanished, we can think of it as a "fossil Strömgren sphere" or a "fossil H II region."

The implications of the Gum Nebula seemed so wide that an international conference was called at the Goddard Space Flight Center in Greenbelt, Maryland, in May 1971, and the details of the physical processes described above were discussed at length.

It was clear that many of the observed quantities—such as the number of electrons in the cloud—are uncertain and further observations should be made to pin them down precisely. (It should be noted that astronomers work with unbelievably large numbers and precision for them may be an order of magnitude, not what ordinary mortals consider exact numbers.) There could, discussion showed, be other sources of ionization: Relatively low-energy cosmic rays produced in the supernova could have contributed to the ionization of the Gum Nebula.

Furthermore, since supernovae occur in the Galaxy roughly once every 30 years, we should see other regions of this type. And indeed, Thomas Matthews and Christian Simonson of the University of Maryland reported at the conference that they have found one in the region of Cygnus in the Northern Hemisphere. The radius of this other "Gum Nebula" is about 500 to 1,000 light-years—strictly comparable with the original Gum Nebula.

What is the fate of such fossil H II regions? What does the future hold for Gum's hot cloud of gas? According to studies at Harvard College Observatory by Richard McCray, the central part of the nebula will cool and recombine into neutral hydrogen gas, leaving the hot outer ring. Astronomers studying galactic structure have discovered several bright loop structures with sizes comparable to the two "Gum Nebulae." It is tempting to identify these large galactic loops with the near-death stage of Gum Nebula evolution, but there are problems. For example, the loops show radio emission and no one knows what the mechanism for its production is.

The Gum Nebula may help in solving other astronomical puzzles. For example, astronomers have for years been occupied with the problem of how all the interstellar gas is heated. There are not enough bright stars or any other plausible source of heat. The formation and decay of successive fossil Strömgren spheres may be the answer.

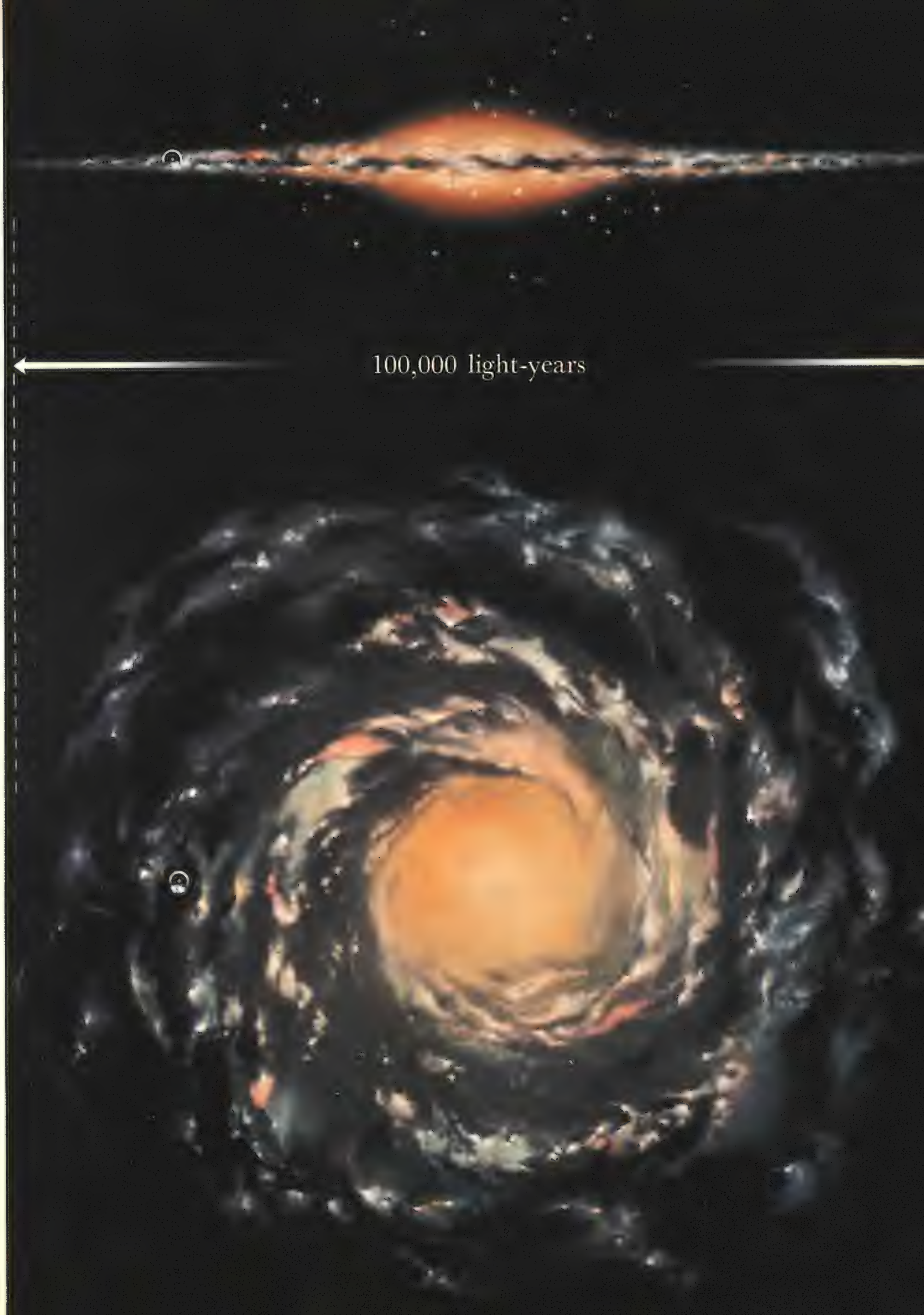
Perhaps the most exciting aspect of the Gum Nebula is an anthropological problem. The tremendous supernova explosion in 9000 B.C. may well have been observed. Indeed, it may even have produced terrestrial effects. An astronomer, Ernst Öpik, has speculated that cosmic rays produced in nearby supernovae might perhaps have altered genes with effects on the course of biological evolution.

X rays, the hypothesis suggests, also might have had some influence, changing the climate by heating up our atmosphere. Even the sudden extinction of the dinosaurs has speculatively been ascribed to the influence of the supernovae. But if *any* supernova produced some earthly effects, the Vela supernova is the best candidate, since of all the "young" supernovae, it is the closest to Earth.

We can be fairly certain, however, that it was at least seen on Earth. It would have been a spectacular event in the Southern Hemisphere, or even in the southern part of the Northern Hemisphere. Another supernova, the one that created the Crab Nebula, was observed and recorded by the Chinese in 1054 A.D. and apparently by the Indians in northern Arizona; the evidence for this is in the form of pictographs in a cave and on a canyon wall. That supernova was 100 times fainter than the brightness we have calculated for the Vela supernova.

So bright a "star"—glowing for months with the light of a quarter moon and easily visible even in full daylight—might well have been recorded, etched in some rock or painted on some cave wall. This is especially likely if the outburst coincided with some other notable event in the culture of the people observing it. While astronomers pursue their investigations of Gum's hot cloud of gas in the southern sky and search for other celestial fossils, this particular aspect is in the hands of anthropologists and archaeologists.

Two views of the Milky Way: from its side (top) and from above. The Galaxy is 13,000 light-years thick at central bulge. Gum Nebula (circles) is about 30,000 light-years from Galaxy's center.


100,000 light-years

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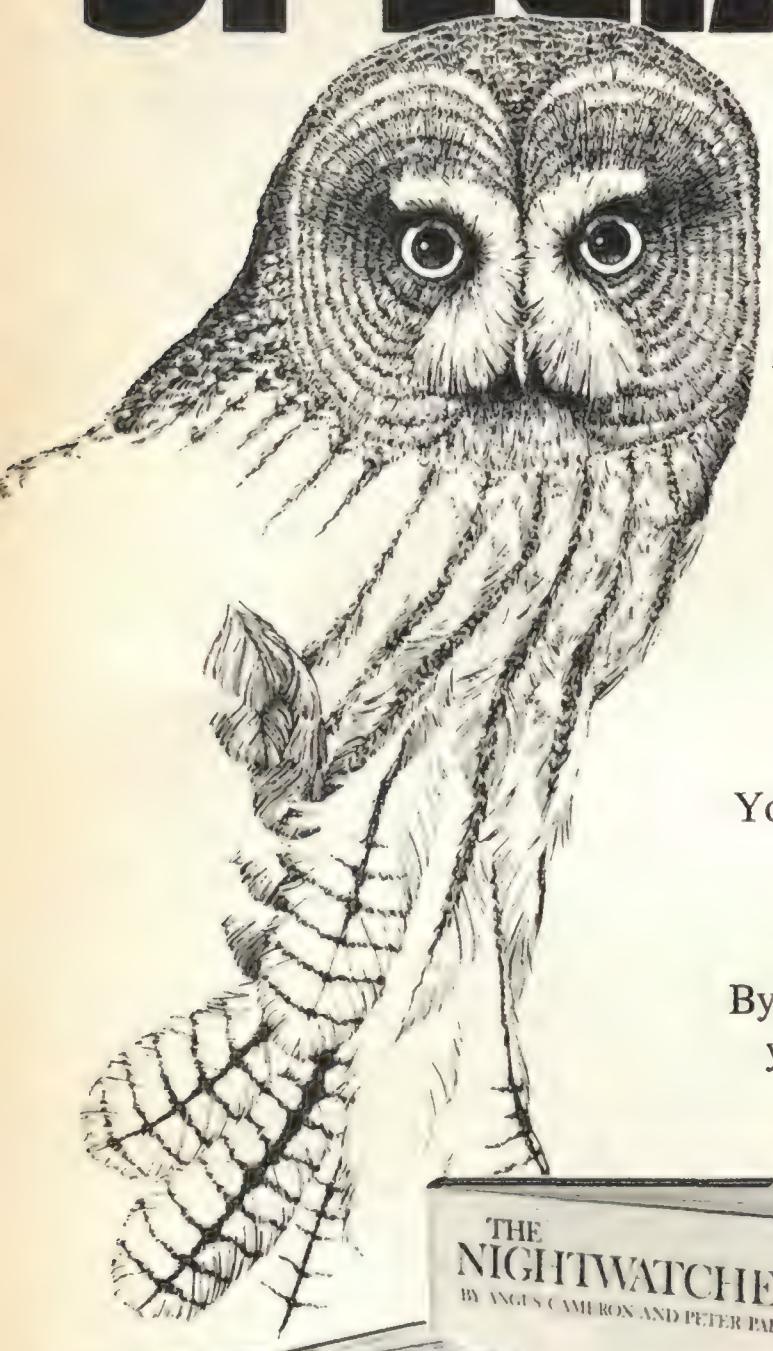

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By Wayne Barrett

Brainy mammals of the sea learn the ways of Man

With no restraints except affection, seals and sea lions work with humans in this 'think tank'—and soon porpoises may join them

Arthur Lowe, captain of the research vessel *Explorer II,* leaned over the rail to grab a line and lost his glasses. They fell out of his shirt pocket into about 20 feet of water. Rocky, a year-old harbor seal frolicking near the boat, was commanded to "fetch." Although Rocky did not see what he was supposed to retrieve, he dutifully dived to the bottom for something to grasp. Moments later he surfaced with a small rug clinched in his teeth.

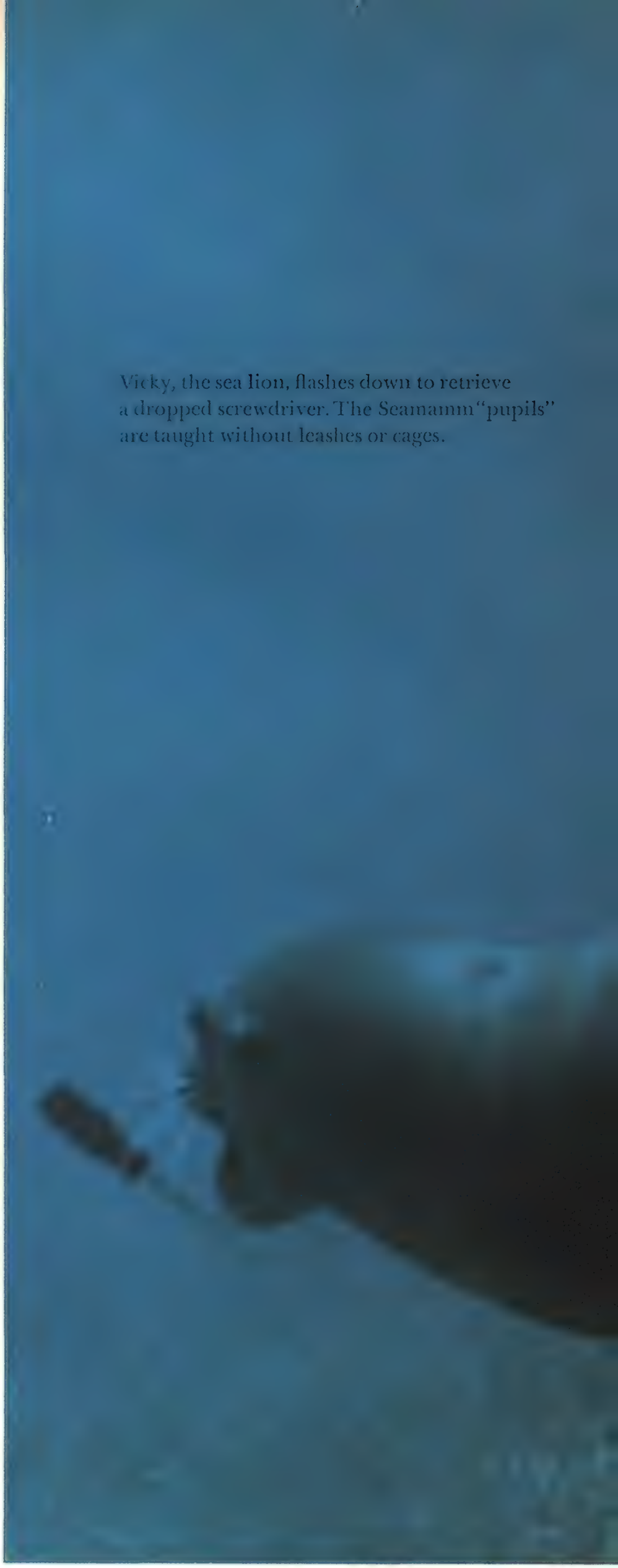
"No, Rocky. Fetch!"

Rocky submerged again and came up with a fish. After several more tries with no better results, Captain Lowe resigned himself to buying a new pair of glasses. Rocky did not give up so readily, however. Next day he brought up the glasses. A day later he produced their case.

To Captain Lowe and his colleagues at Sea Mammal Motivational Institute (Seamamm), an innovative marine research organization based in the Florida Keys, Rocky's performance was not extraordinary. Seamamm personnel are accumulating evidence that seals and sea lions are astonishingly intelligent, perhaps as smart as chimpanzees and dolphins. If so, they could, under wise management, benefit Man greatly. Fetching objects that fall overboard—including, theoretically, humans who can't swim—is just one example.

Author Wayne Barrett, an inland Marylander and SMITHSONIAN *contributor, attended Seamamm's damp classes as schoolmate to the pinnipeds.*

Vicky, the sea lion, flashes down to retrieve a dropped screwdriver. The Seamamm "pupils" are taught without leashes or cages.



School for sea mammals

Margo Jackson gets a "kiss" from Rocky. Actually, he is sniffing her breath to identify her.

Seals and sea lions have large, complex brains in relation to body weight, an indicator of high intelligence. The fact that they can leave the water and move about on land (sea lions are especially adept) makes their brain power all the more valuable. For they alone, of all wild creatures, are equipped both mentally and physically to aid Man's exploration and ultimate habitation of the depths of the sea.

Until recently, little thought and practically no research have been devoted to these animals' potential as Man's best friends at sea. They have been used, instead, as carriers of explosives in underwater military exercises and, in the case of sea lions, as circus animals trained to juggle balls and leap through hoops. But the most widespread use Man has made of the pinnipeds (seals, sea lions and walruses) is to slaughter them: fur seals and baby harp seals for their pelts, walruses for their ivory tusks. Commercial fishermen and sportsmen also take grisly tolls.

The wanton killing has become a concern of the U.S. Congress, with the introduction of bills aimed at protecting all marine mammals—whales, dolphins, porpoises, manatees, sea otters, polar bears, as well as the pinnipeds. This also concerns Seamamm. Its director, Robert L. Horstman, invited to testify before the House subcommittee on Fisheries and Wildlife Conservation, declared: "The fur and perfume industries have carried out their bloody business too long on behalf of the comfortable ladies of Scarsdale and Beverly Hills." He urged a five-year moratorium on the taking of marine animals, "to allow for critical census and deeper social and behavioral understanding of ocean herds and the results of harvesting them."

Studying marine animal behavior under natural conditions is something Seamamm has undertaken in the face of staggering odds. The nonprofit organization as yet has received no government grant or large foundation funding. It conducts its work in an open environment, not in holding tanks or behind fences. There isn't even a leash to restrain the animals; they are free to leave any time—and sometimes do, with interesting results. But despite meager means and unorthodox ways, Seamamm in two years has quite possibly contributed more toward the understanding of these sea mammals than any other organization. This is due to perseverance. Staff and animals work—and play—together every day; they practically live together.

An extraordinary rapport has developed between them. Rocky can be dozing on the dock oblivious to people talking, dogs barking or sails snapping in the breeze. Yet, let Amanda Mathews, his handler, step onto the dock, and he will immediately awaken and drag himself on his foreflippers to meet her. He recognizes her not only by voice but by footfall.

Bob Horstman believes that seals and sea lions respond to many stimuli. One is obviously odor. Animals at Seamamm invariably sniff a person's breath and hair to establish identification. Bob described the treatment he gets from Vicky, a two-year-old California sea lion: "When I come home from a trip, Vicky

will greet me with what looks like a kiss. But what she's really doing is smelling my breath. If she gets Busch Bavarian beer, she knows it's me." In the water, Vicky will identify a diver by swimming up behind him and sniffing his snorkel tube.

Through a series of experiments, Seamamm hopes to gain knowledge of a sea lion's ability to locate objects through some kind of physical sonar. Several times while swimming with snorkelers, Vicky has exhibited an awareness of predatory fish—barracudas—long before they came into view. She reacted by streaking for the ramp alongside *Explorer II*. Her behavior could also warn of an approaching shark.

Staffed by a spirited cadre of college-age people recruited by Bob and his wife Nina, Seamamm exists as a halfway house where man and pinniped meet on common ground—and water. This meeting place lies isolated among the mangroves of Key Largo, where deep, clear creeks give access to the Atlantic. The site was donated by Miami businessmen Harper Sibley jr. and Morris Burke, developers of Ocean Reef Club on Key Largo, and it is buffered by John Pennekamp Coral Reef State Park. Confined now to a trailer, Seamamm plans to build a live-on barge and an underwater habitat. A muddy creek bank lined with sacks of cement will form a cobblestonelike breeding beach. At sea, the meeting place is where the Horstman's 65-foot *Explorer II* drops anchor, usually on coral reefs in the Atlantic or the Gulf of Mexico.

Earlier, Seamamm's land base was at Key Colony Beach, halfway down the Keys, in a converted restaurant beside a canal. While close to open water, the facility was too close to people. Sometimes a person, thinking the restaurant still in business, would take a seat at the counter and order a sandwich. Another distraction was nearby swimming pools, which Vicky liked to visit. Rocky frequently paid calls to the marina next to Seamamm headquarters, occasionally hitching a ride on a fishing boat.

They may be tomorrow's lifeguards

In addition to Rocky and Vicky, Seamamm's entourage includes a seven-year-old female sea lion named Tinkerbell, refugee from a "trained-seal" act, and Diana, a baby fur seal acquired from the Pribilof Islands breeding grounds through an agency of the U.S. Department of Commerce. Soon Seamamm hopes to adopt a bottle-nosed dolphin.

Seamamm views its animals as forerunners of breeding herds that can be motivated to serve Man in a controlled but free state. Such motivational training could result in seals and sea lions acting as tomorrow's lifeguards. Rocky, at less than half his ultimate weight of 200 pounds, demonstrates that he can easily tow

A pointed finger and a "bang!" from Amanda Mathews sends Rocky on his back, playing dead.

Vicky, a lively young pupil, grabs a rescue line that might someday save a swimmer.

a person or a small boat. Bob Horstman commands him to "rescue" Bobby, his 13-year-old son. Flashing through the water, the seal takes a flotation ring for Bobby to grasp, then pulls the boy back to the dock.

Ferrying equipment to divers or tools to workers on the sea floor are other tasks pinnipeds might be expected to perform. Once a man decides to take up oceanographic housekeeping, seals and sea lions could help him put meat on the table. Want fish for dinner? Send a pinniped for them.

Bob Horstman believes that seals might be capable of herding fish into nets. He has noticed that fish tend to school behind Rocky. That the seal could be trained as a Judas animal seems beyond doubt. He learns quickly, as handler Amanda Mathews demonstrates. "Bang!" she says, pointing a finger at Rocky, and he immediately rolls on his back.

Food reward, usually in the form of mackerel laced with vitamin supplement, motivates both Rocky and Tinkerbell, though both can and do fend for themselves. This includes nibbling on seaweed, which at times seems to exert a catniplike effect on them. At regular feeding periods, a toy cricket summons Rocky and Tinkerbell, a continuous clicking signaling the harbor seal, a series of short clicks calling the sea lion.

While working in the ocean, Seamamm staff members reward the pair with "money" instead of raw fish, which might attract sharks. This money—plastic tokens dubbed "Tinker's toys"—is given the animals when they complete a task, such as retrieving an object. To simulate retrieval of tools, for example, Amanda will fling three objects into the water: one that floats—a rubber ball; one that sinks slowly—a diver's face mask; and one that sinks rapidly—a metal toy. At voice command, Rocky torpedoes through the water to snatch the plummeting toy in his teeth, swings upward to loop the face mask around his head, then surfaces to nudge the ball toward his handler. Then he is paid.

Rocky and Tinkerbell have learned to bank their earnings in transparent containers and redeem them ashore or on the boat at the rate of one fish fillet per token. Nina Horstman says Tinkerbell is "just like a woman"—better at withdrawals than deposits.

Vicky reacts to a different kind of stimulus, being taught to respond to displays of affection or the withholding of them, much as a dog does to a pat or a reprimand. Although seals do not like to be petted, sea lions seem to enjoy it, especially if they initiate the action—Vicky nuzzling Nina's ankle, for example. In the water the svelte little sea lion loves to play tag with humans. Once she showed her affection for Nina by bringing her a gift from the sea—a mouthful of wriggling eel.

Training sessions in the water proceed pretty much on the animals' own terms and, at times, it is difficult to determine who is teaching whom. When an animal does not choose to cooperate, its handler does not force it. There is no abuse. Bob instructs his staff to ask themselves: "If you were a seal, would you have had a good day today?"

Seamamm handlers keep daily charts on their charges, noting reactions to commands by voice and gesture, behavior at play and while "in school," and variances in temperament and well being. If Vicky swallows pebbles, not unusual in sea lions, that is recorded and, when possible, the stones are counted. After a swim with Bob, she regurgitated 107. "She

Seamamm's director, Robert Horstman, discusses chart with his staff on *Explorer II's* afterdeck.

rattled in the water," Bob said. One theory holds that sea lions gulp stones for ballast. Or they might aid digestion. Seamamm hopes to solve this mystery and others, such as how a pinniped throttles down its heartbeat by a factor of ten when diving. Biotelemeters harmlessly swallowed might radio back useful data.

Besides being a chronicle of behavior patterns, the daily charts can also serve as health guides. If an animal refuses its food, a check of the record will reveal whether or not it is due to begin a period of fasting. Loss of appetite at the wrong time might indicate illness, which could then be diagnosed and treated. Had such a record been on file for Shag, the harbor seal that inspired Seamamm, he might still be alive.

Subject of a magazine article and numerous newspaper stories, Shag during his four-year stay with the Horstmans became a legend somewhat parallel to that of Elsa the lion. Shag was captured as a newly born pup off the coast of Maine and taken to the Horstman's beachside home near Atlantic City, New Jersey. He spent his first weeks sunning on the sand, swimming in shallows and lapping up a mixture of eggs and cream drizzled down a warm human ankle. When hungry he gave a bleating call, an ability he would lose in several months, for harbor seals, unlike sea lions, soon become mute.

"His only leash was our love"

Nina taught Shag to eat solid food by placing a piece of herring on the back of his tongue. By the time he had grown to be about the size—and shape—of a watermelon, he was catching his own food. He located schools of fish, the Horstmans believed, by watching circling gulls. Seals have sharp teeth. Shag used his on human flesh only once when Bob playfully lifted him out of the water. In handling Shag, the Horstmans learned that a seal isn't likely to snap in the sea—his comfortable environment.

Shag could have run away any number of times, for as Nina has said, "His only leash was our love for him." That evidently was enough; he never abandoned his human friends, even when he was subjected to a new environment in the Florida Keys. It was because of Shag, in fact, that the Horstmans decided to sell their house and move to a warmer climate. There they resolved to learn everything they could about sea mammals, with Shag as their guide. The charter for Seamamm was drawn up late in 1969, not long before Shag died of an intestinal infection.

Bob, the 39-year-old president of an electrical equipment manufacturing company in Pennsylvania, arranged his schedule so that he could be at Seamamm three to four days at a stretch. Nina and the four Horstman children lived on *Explorer II*. A staff of

Rocky tows Suzie Redmond as though she were drowning. She is on student staff at Seamamm.

young people was assembled, lured by the uninhibited methods rather than the modest pay. They began accumulating a library on marine animals, publishing a newsletter, planning projects and scouting for funds.

Already, a few grants from individuals have rewarded their efforts. One gift came from Arthur A. Houghton jr., president of Steuben Glass, chairman of the Metropolitan Museum of Art in New York, and now a member of Seamamm's advisory board. His involvement stems from a meeting with Tinkerbell.

The unlikely chain of events began on a gusty spring day in 1971 down in the Dry Tortugas. Remote from mainland distractions, the area presents ideal conditions for Seamamm's offshore work with marine animals. Tinkerbell had been here before and had shown no inclination to flee. But this time, while working with her handler away from *Explorer II,* she suddenly headed northward and didn't turn back.

Tinkerbell was not in the best condition for extended travel. Besides having a lame front flipper, a permanent injury suffered when she was a sideshow performer, she bore the marks of a recent encounter with a barracuda. *Explorer II,* her crew scanning the choppy sea, cruised the area until supplies became dangerously low, then returned to Key Colony Beach. With every passing day hope dwindled that Tinkerbell would show up at Seamamm headquarters. Nor did she reappear in the Dry Tortugas.

A few days after Tinkerbell's disappearance, Seamamm heard that fishermen were pursuing a seal in the Gulf of Mexico, reportedly for a $1,000 reward. It happens that one of Seamamm's objectives is to find and observe the Caribbean monk seal, a species that may be extinct, although lighthouse keepers and fishermen have reported hearing barking seals off the coast of Nicaragua and Costa Rica. With this and little else to go on, Seamamm has distributed leaflets offering a $500 reward to anyone who can lead the way to monk seals. This might explain the report of a big reward sought by the Gulf fishermen, but the chase apparently failed, for no claim was ever made.

Nine days after Tinkerbell left the Dry Tortugas, a sea lion with a crippled flipper swam ashore at Boca Grande, Florida, 167 nautical miles north. Seeing two 13-year-old girls on the beach, the animal followed them up wooden steps to the patio of Mrs. Rutherfurd Stuyvesant Pierrepont. Too exhausted to go any farther, it fell asleep beside her swimming pool.

Mrs. Pierrepont immediately called her neighbor, Arthur Houghton, who volunteered to try to find the animal's owner. He telephoned Ringling Brothers-Barnum & Bailey Circus, Miami Seaquarium, radio stations, newspapers, finally the New York Aquarium. The Aquarium's acting director, Douglas Kemper, advised Mr. Houghton to enlist Seamamm's aid.

In minutes, a bedlam of joy erupted at Seamamm headquarters. "Tinker has been found!" "Tinker is safe!" Several hours later Nina and Steve Hawes, Seamamm's young business manager, stepped off a chartered plane and drove to the Pierreponts'. Next morning Tinkerbell climbed into Mr. Houghton's VW bus for the ride back to headquarters.

After recuperating on shore for a couple of days, the animal resumed her routine. Three months later, she ran away again. Her destination: Boca Grande.

If she intended to call on old friends at the Pierrepont home, she was out of luck. They had left for the summer, and the wooden steps she climbed to the patio had been removed. But she discovered other friends, thanks to the publicity from her previous visit. "Tinkerbell!" shouted a dock worker. The U.S. Coast Guard was informed and passed the word to Seamamm. Nina again flew to the rescue, followed by *Explorer II.* Tinkerbell swam to meet it.

Seamamm is very patient with its animals. If one of them runs away, the organization will exhaust every resource to find it—then turn it loose again. Tinkerbell, caged for most of her life and frequently beaten by one of her former keepers, appreciates this freedom, and no one at Seamamm faults her for taking advantage of it. But no one at Seamamm expected her to leave a third time—at least so soon. A few weeks after her last long trip, Tinkerbell struck out across open water again, while *Explorer II* was anchored over a reef in the Atlantic. No, she didn't return to Boca Grande. This time the prodigal sea lion came home.

Tinkerbell deposits a plastic disc of "money"
in her bank. She earned it in training
and she can withdraw it and "buy" a bit of fish.

The first and 'latest' architect for the Smithsonian

James Renwick, who designed the old red castle on the Mall, now has his name on the Institution's newest museum

By a happy coincidence, the Smithsonian Institution, which is headquartered in an authentic-looking Norman castle, has just opened its newest art gallery (right) in a beautifully restored building designed by —and named for—the same trailblazing 19th-century architect, James Renwick jr.

This coincidence is serving to refocus attention on the figure who gave Washington, New York, Newport and other fashionable places a series of buildings that, however eclectic, helped to lay the foundation for an American style of architecture.

Renwick's work was already well known in Washington when he was commissioned by William Wilson Corcoran, a retired banker who had made his fortune by underwriting the Mexican War, to design a new gallery of art. That was in 1858, and by then Renwick had not only seen his exuberant Smithsonian castle rise on the south side of the Mall, but was remodeling Corcoran's own house and was working on a cemetery chapel for him (p. 69).

The gallery he designed for the corner of Pennsylvania Avenue and 17th Street was the largest built in the United States up to that time, and it was intended to house Mr. Corcoran's own vast and varied collection. This it managed to do very well until Corcoran's unabated collecting fever required new and larger quarters. In 1899, therefore, the Corcoran Gallery of Art moved into a new building (still in use) a couple of blocks away, and the federal government moved into the old one. Renwick's structure, in a style variously described as "Second Empire" or "French Renaissance," was bought for $300,000 and turned into the U.S. Court of Claims. Now, after close to 75 years, the handsome old building has been returned to its orig-

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By Carol Cutler

Drawings by Richard Schlecht

inal function of art gallery. Only the name has been changed; the Smithsonian is honoring its first architect by calling its latest museum the Renwick Gallery.

This important building very narrowly escaped demolition, a fact that makes the superb restoration even more meaningful. In 1956 the Congress had all but decided to knock down Renwick's structure and appropriate three and a half million dollars for a new Court of Claims on the same site. These efforts reached an impasse when various congressmen started to write into the bill requirements for the use of their home-state building materials, and when other arguments arose over whether the new court should indeed be located on the Corcoran site or built closer to the other courts. Fortunately for the building, the delay lasted long enough for President Kennedy to decide in 1963 to preserve all of the Lafayette Square area, including the old Corcoran, for offices of the Executive branch.

From oblivion to the Smithsonian

Two years later President Johnson officially turned the former Court of Claims over to the Smithsonian. (It is a quirk of politics—and perhaps an indication of changing attitudes in this country—that in 1956 it was the then Senator Lyndon B. Johnson who introduced in the Senate the bill calling for the destruction of that same Court of Claims, on the grounds that it was "nearly 100 years old . . . and, with advanced age, has become a fire hazard" which might cause the loss of irreplaceable court records.)

The precarious history of his Corcoran Gallery would probably have amused the urbane James Renwick. Over six feet tall, he cut an imposing figure in the fashionable circles in which he moved; well-born, well-traveled, cultivated, an art collector and a gourmet, he fitted the traditional pattern of the "universal man," one of the few in the country at that time. W. W. Corcoran was another—and perhaps that is what drew them together, socially and as architect and client.

Serious American art collectors made up a rather small circle in the mid-1800s, and most of its members knew one another. There were the Walters in Baltimore, the Lockwoods in Connecticut and the Aspinwalls in New York. Renwick married an Aspinwall daughter, and designed for his father-in-law an art gallery to hold the burgeoning Aspinwall collection. It is surmised that W. W. Corcoran first met young Renwick in the Aspinwall home. When he needed an architect to remodel his house and plan a chapel for the Oak Hill cemetery in Georgetown, who better than that attractive young man in New York?

Renwick had skyrocketed to fame with his very first commission in 1840, when he won a competition to design Grace Church at Broadway and 10th Street, then New York's wealthiest and most fashionable parish. Not bad for a 22-year-old self-trained architect. He had studied engineering at Columbia in New York and had graduated in 1836, before his 18th birthday. He immediately joined the engineering staff of the Erie Railroad, and was presently supervising construction of the Croton aqueduct. In all this he was only

James Renwick

James Renwick: replica of a portrait bust modeled in Italy. The original is in Grace Church.

following the family pattern; his father, also James Renwick, was a renowned scholar and professor of engineering at Columbia, and his two brothers were also eminent engineers. Not much is remembered about the women in the family, except that his mother was wealthy and socially prominent.

The Grace Church building that made Renwick's reputation (page 65) was constructed between 1843 and 1846 and remains one of New York's most gracious edifices. It is a sparkling example of a Gothic cathedral with transepts, done on a reduced scale. More ecclesiastical commissions in New York followed: Calvary Church at Fourth Avenue and 21st Street, Church of the Puritans in Union Square, St. Stephen's, St. Bartholomew's at Madison Avenue and 44th Street, and others. Half are gone, but not the greatest of them: St. Patrick's Cathedral on Fifth Avenue (pages 66-67).

Renwick's plans for that triumphant structure were started in 1853, but by the time the cornerstone was laid five years later he had refined his most ambitious creation into a smooth combination of the best elements of French, English and German Gothic styles. Today it is a monument not only to Renwick the brilliant architect, but to Renwick the forward-thinker.

He had the courage to do what few, if any, of the country's major architects would have even considered at that time: accept a commission to build a Roman Catholic church, let alone a cathedral. The leading architects of the day were Protestants, and their feelings were such that it was considered a mild form of heresy to work for the Roman church.

At that time the Roman Catholic church in the United States was by no means as wealthy as it is today. The great influx of impoverished Irish immigrants, fleeing the potato famine, was already well under way. More than once the point was made that the funds going into so grandiose a monument could better be spent to aid the hungry flock. Shrugging off such criticism and the resentment of his colleagues, Renwick designed not only soaring St. Patrick's but also the building for the Archdiocese. It was nearby on Madison Avenue, but has since been demolished.

Although Renwick's reputation was made by fashionable Grace Church and other ecclesiastical structures, he quickly became court architect to the rich. He was one of them himself—a wealthy man of talent and taste with whom they could feel at ease. He and his clients discussed matters on the level of equals, which makes for a comfortable working relationship.

New York quickly blossomed with Renwick-designed mansions for the Morgans, the Palmers, the Jameses and other nabobs. Unfortunately, very few of these buildings remain, having given way to more profitable skyscrapers. Near Cooper Union, however, there stands Renwick Row (or Renwick Triangle), a series of row houses originally built as a complex for the well-to-do. (Renwick's successor as court architect to the rich, Stanford White, was born there.) These houses are being lovingly defended against the bulldozer, not as an island of privilege but as a valuable

Grace Church, at Broadway and 10th Street in New York, was Renwick's first triumph.

part of the New York City architectural heritage.

Soon Renwick was building suburban "cottages" and "villas" for his clients on Staten Island, in Dobbs Ferry, New York, and at Lenox, Massachusetts. Newport mansions came next. Then all of New England was sprinkled with his Renaissance-style designs.

He also branched out into institutional architecture: the Free Academy College of the City of New York, banks, the former facade of the New York Stock Exchange, three hotels, hospitals, asylums, the main hall at Vassar College (which still stands as one of his most harmonious triumphs), the old New York post office and Booth's Theater.

Although many of his buildings are still in use, architectural historians probably regret most the disappearance of his own house in New York. They believe that it must have been a remarkable building, one in which no holds were barred for the most avant-garde American architect of the mid-19th century. He was an innovator and experimenter, and he had a keenly inquiring mind. His taste was impeccable, and both he and his wife had inherited large fortunes. Adding all this up, one begins to sense that it must have been an extraordinary residence.

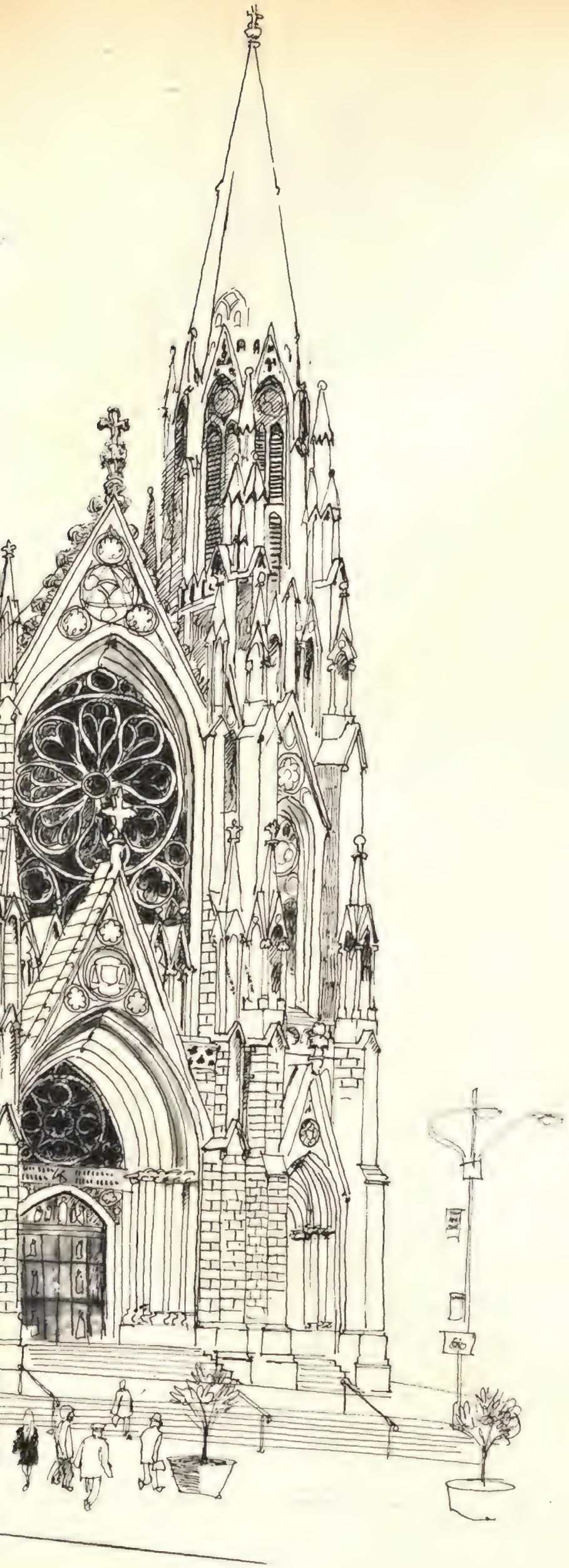
A taste for travel and stylish living

In keeping with his life style, Renwick maintained two steam yachts and got a pilot's license so that he could handle them himself on occasion. One of them he kept in Florida. That state was not then the fashionable winter haven that it later became; New Yorkers of Renwick's set considered it to be little better than a malarial swamp—but of course Renwick was ahead of his time.

Most of his traveling was done abroad; he made at least one trip every two years, which was a lot in those days. Sketchbook and notebook were always in hand. During an extended stay in Edinburgh he joined the local archaeological societies, participated in the examination of old buildings, studied local architectural publications and even took a trip to the nearby port of Leith just to see a new kind of ship propeller that he had heard about.

During this visit his wife fell ill with a liver ailment from which she never recovered. At that time he wrote to a nephew, "I am trying to get reconciled to it"—meaning Anna Aspinwall's death. She died in 1880; they were childless, and he never remarried.

His constant travels were essential to the development of his approach to architecture and the evolution of the styles he brought back to the American scene. He made several trips to Paris, where Napoleon III and the Empress Eugénie were presiding over an extravagant and glamorous society. With his letters of



introduction and his outgoing personality, Renwick quickly entered that society and readily accepted its excesses, particularly in architecture. The new wing of the Louvre had just gone up. It was the inspiration for Renwick's Corcoran Gallery of Art, which is basically Second Empire in style—contemporaries, in fact, called it the "American Louvre."

Before Renwick brought Second Empire architecture to Washington, he had used the Gothic style in his Oak Hill chapel (page 69) and so-called "Norman" for the Smithsonian Institution's "castle" (page 68). Renwick won the award for the Smithsonian in open competition with eleven other architects. To supervise the competition, the Institution's Board of Regents had appointed a building commission. Its most influential member was Representative Robert Dale Owen, son of the Scottish-born reformer who had founded the ill-fated New Harmony community in Indiana; he wanted a "large and showy building." It says something of Renwick's reputation that Owen's group in effect decided on Renwick's Romanesque design almost a month before the competition closed. This caused some pain to the other architects, who charged that the competition was unfair, that a selection had been made before all the entries were in (which seems true) and that Renwick had not even adhered to the specifications. To add insult to injury, Renwick won not only first prize but the second prize as well—with an even more elaborate Gothic plan.

From "lilac grey" to red

Specifications aside, it was—and is—a spectacular building. It is built of a dark red sandstone (in the original plans it was called "lilac grey freestone") that came from a quarry about 23 miles upriver from Washington. The stone was brought downstream on barges, then moved to the building site by way of a squalid canal that then ran through the Mall.

One can imagine Renwick's sense of the dramatic being pleased by the building site as he saw it in 1846. It was then about 20 feet above the level of Pennsylvania Avenue, and nothing stood between; his pennanted and turreted building would sit on the knoll and rule from there.

The castle, as we know it today, has been somewhat modified, following a disastrous fire in 1865. The pity of it is that Renwick was a pioneer in fireproofing buildings, including the Smithsonian. But an architect's best-laid plans can go up in smoke when a work-

Renwick is undoubtedly best known today for
St. Patrick's cathedral on Fifth Avenue, New York.

man accidentally connects the iron stove-piping to an attic opening instead of a chimney flue.

Corcoran's gallery was Renwick's last major project in Washington. The collaboration between architect and client must have been a happy one. Corcoran and Renwick were not only like-minded but men of their day; they strongly believed in "contemporary" art and architecture, as the term was then understood. Both were also renowned gourmets, and one wonders if they ever shared the New England venison that Daniel Webster used to send to Corcoran. When Webster found himself short of funds, Corcoran bought his Washington house and later asked Renwick to expand and remodel it. The house, which stood between Farragut Square and H Street, was demolished many years ago.

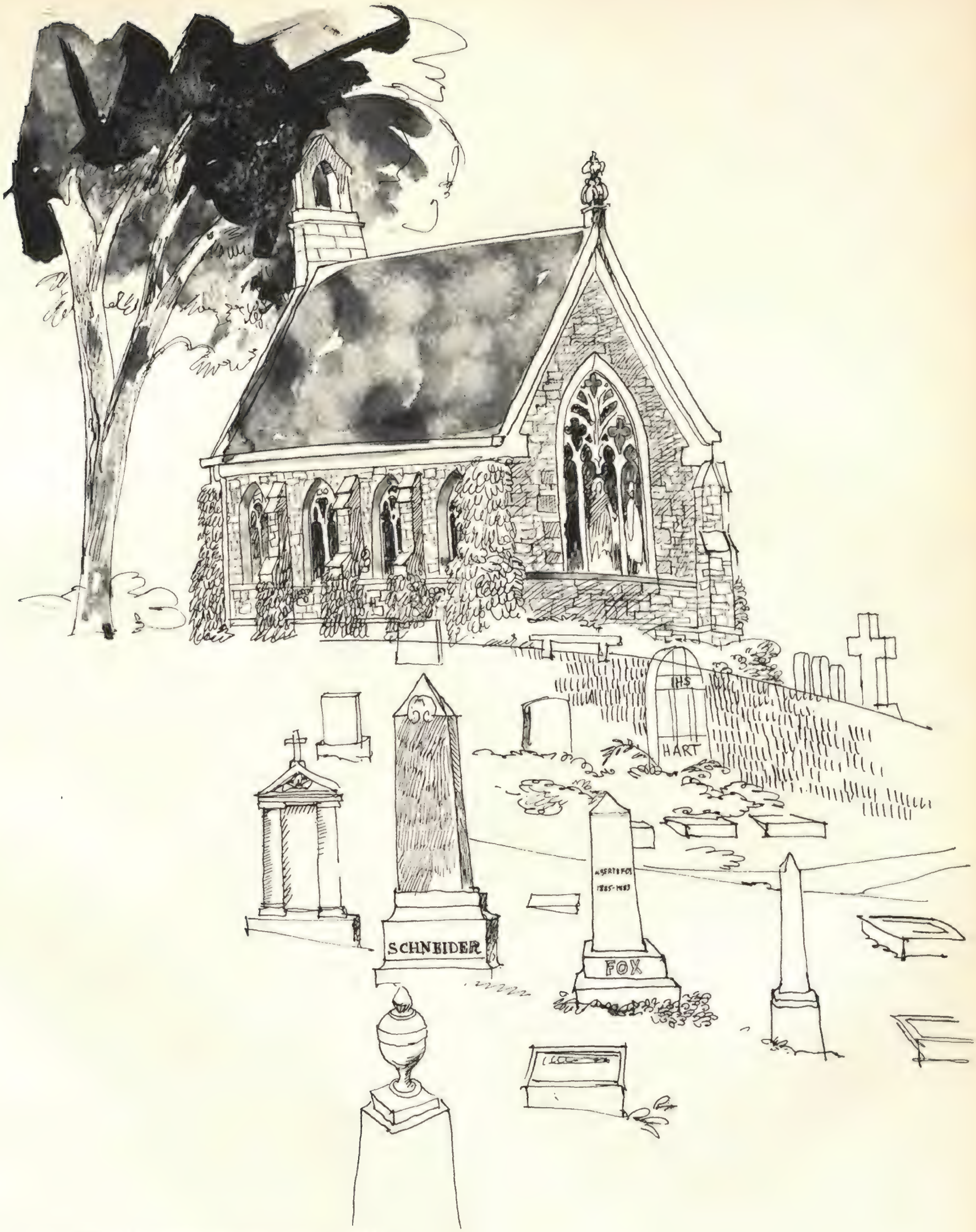
But the gallery Renwick designed for Corcoran now stands in refurbished splendor at Pennsylvania and 17th Street. Begun in 1859, its construction was interrupted by the Civil War and its occupation by the Union forces; it was not until 1871 that its doors opened to the public, when Corcoran staged a grand ball as a preview, and not until 1874 that it began its career as a museum of art. It now opens a new chapter as a national showcase for American design, crafts and decorative arts. The elegantly restored exterior looks very much as it did in its prime, although some of the niches for statuary are gone and the statues themselves, of "the greatest artists of all time," are now in Richmond and Norfolk. The interior was more of a problem. It had been redone several times and, in fact, Renwick's original plans were never carried out; by the time construction was resumed after the Civil War, he was somewhat out of style and was largely bypassed.

Hugh Newell Jacobsen, the Washington architect who was in charge of the interior restoration, says that —given these conditions—the intent was not "restoration *per se*" but "in the spirit of Renwick's time."

Although more modest than Corcoran's extravagant ball, with its cages of canaries hanging from the ceiling, the opening of the Renwick Gallery on January 28 was festive enough. For its inaugural season, the administrator of the Renwick, Lloyd E. Herman, has scheduled eight concurrent exhibitions (see *Smithsonian highlights,* page 81).

In addition, the Corcoran Gallery, in a family gesture, has loaned some of the paintings that originally had hung within the red brick walls. The present Corcoran Gallery is only two short blocks from the Renwick, so that now the two men who collaborated so effectively are reunited in a way that would please them both: bringing art to the public.

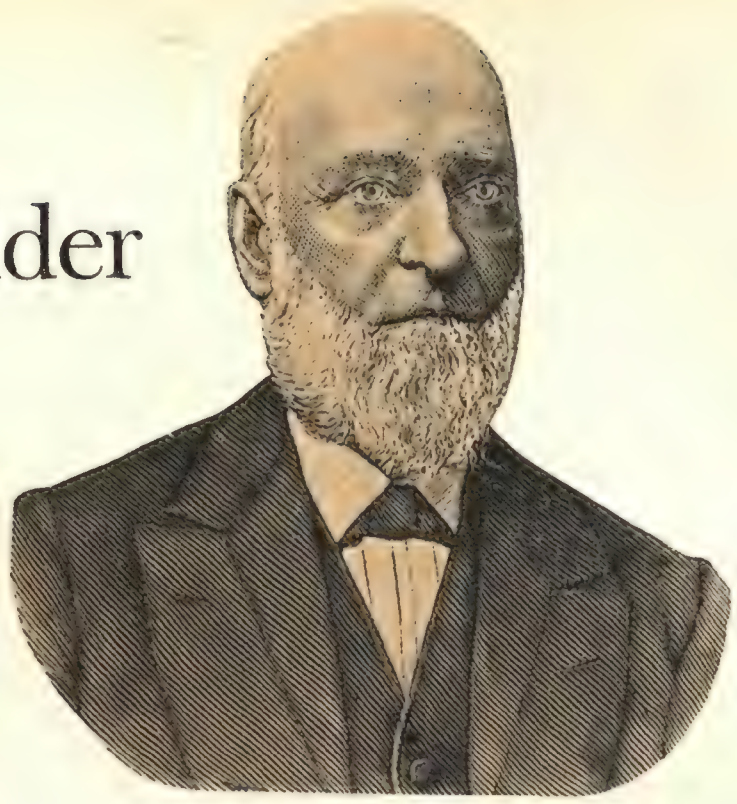
The familiar Smithsonian castle provides
one of Washington's most memorable silhouettes.



This jewel-like Gothic chapel stands in Oak Hill Cemetery on the edge of Georgetown.

By George Walton

Hezekiah Smith, builder of a 'safety' bicycle



Vermont-born Smith parlayed his Yankee ingenuity into a free-wheeling success story.

Nineteenth-century millionaire, precursor of today's fad, inspired a commuters' monorail and kept the real Mrs. Smith out of sight

Today's bicycle craze recalls that of the Eighties and later. It swept the country and continued past the turn of the century, and its impetus sprang importantly from the development of the "safety" bicycle.

In 1816, a German, Baron Karl von Drais, invented the first true bicycle—a two-wheeled vehicle propelled by feet on the ground like a scooter. In 1839, a Scot, Kirkpatrick Macmillan, developed the first velocipede with treadles—foot levers that were pushed down to turn the wheel. It became obvious that the larger the propelling wheel, the greater the speed: hence the so-called "penny-farthing," a huge wheel trailed by a small one. This arrangement caused some spectacular disasters, so young George W. Pressey of Hammonton, New Jersey, designed a velocipede with a large rear drive wheel and a small front wheel for steering. This bicycle did not readily send its rider hurtling over the handlebars in a helpless somersault when it struck a stone. It was, in fact, a reasonably safe bicycle.

Pressey's machine was manufactured by Hezekiah B. Smith, a colorful and remarkable man who in many fields was ahead of his time.

On a bright day in 1878 a procession marched toward the courthouse square of Toms River, New Jersey. The band, resplendent in gold-braided uniforms, struck up "Hail the Conquering Hero Comes," and six matched black horses drawing the bandwagon set their silver-mounted harnesses jingling.

Several carriages followed the band. In the first, an open landau, sat two men. One was large and middle-aged, thickly bearded, continuously waving to the crowd. The other was old and wizened, a silent figure huddling under a paisley shawl. Behind them came a one-man sulky pulled by a harnessed moose!

Thus did Hezekiah Bradley Smith run for Congress on the Democratic and Greenback ticket. He had decided that the only way he could lure his rural backers to his meetings was by arousing curiosity. Hence the moose and the presence of Alexander Hamilton Stephens, former vice-president of the Confederacy, as drawing cards. South Jersey had been pro-South during the Civil War: "a nest of Copperheads."

The farmers flocked to the rallies, drawn either by the moose or the former rebel, and Smith was elected. Two years later, the farmers failed to attend either the rallies or the polls. Stephens was running for governor of Georgia and was no longer available, and people had concluded that once you have seen a harnessed moose it isn't necessary to see one again. Smith lost and later served a term as a state senator.

Hezekiah B. Smith was born in Bridgewater, Vermont, where his family had long been neighbors of the Coolidges of nearby Plymouth. At 14 he found a job with a cabinetmaker in Woodstock and was soon given charge of all the shop machinery.

Colonel Walton, lawyer and teacher, has written ten books. His latest, The Tarnished Shield, *about today's army, will appear in September.*

Within five years Hezekiah had his own furniture factory in an abandoned blacksmith's shack and was soon shipping furniture to Boston, Lowell and Springfield. He saved his money and by early manhood had become prosperous and respected.

Smith eventually became a leading manufacturer of window blinds. By the end of the Civil War he had outgrown his plant. Determining to move, he visited the village of Shreveport (also called Shreveville), New Jersey, to buy a plant with unlimited opportunity for expansion in a rural area where he would not compete for labor. Nestling along Rancocas Creek, the village consisted of several serviceable large buildings, a tavern, about 35 homes for employees and a dilapidated manor house. A millpond provided water power, a single-track railroad connected with the main line at Mount Holly, three miles away.

Smith bought the whole community, including 2,000 acres of land, for a reputed $23,000 and had the name changed to Smithville. His machinery was installed, the millpond enlarged and extensive additions made to the factory buildings. New employees' homes were constructed, a warehouse built as well as a hotel, a school, an opera house and a ballroom.

Tailor-made town for $500,000

To a large extent Smith rebuilt the manor house, adding a billiard room and bowling alley, a stable, coach house, conservatory and greenhouse. Formal gardens were planted, and around the whole a tall brick fence was constructed with large eagles above the main gate. A barn with a tower that could be seen for miles was constructed. Smith claimed that he spent altogether over a half-million dollars on his town.

Then Agnes Gilkinson arrived, introduced as Mrs. Smith, as charming a hostess as she was beautiful. As a girl she had been one of Smith's employees. He sent her to finishing school and later to the Woman's Medical College of Pennsylvania in Philadelphia, the only one in the country at that time. In Smithville, Agnes acted as company physician and edited the Smithville *Mechanic,* a weekly magazine.

The H. B. Smith Machine Company became the largest woodworking machinery plant in the country and, to diversify, filed about 65 patents—some quite startling. Experiments were made "with a mechanism applied in the center of a long-line shafting which would under sudden stress allow either section to revolve independently of the other." Perfected, this later became the automobile differential.

In 1879, one of the nation's first horseless buggies was constructed at Smithville. Using a kerosene-burning steam engine with a fire-tube boiler and three-speed gear, the vehicle operated successfully on a

Here is Smith's statue of his beloved Agnes.
Later his son smashed it and sank it in the river.

Spinning wheels whirl through a city street
in this cartoon of the bike boom of the Eighties.

number of trial runs but, since it frightened both horses and people, Smith concluded it was too dangerous. "Put it away, Fritz," he said to his helper. "We're 20 years ahead of time."

Smith had high hopes for an experimental tricycle, but it never caught on except as a toy. It is now on exhibit at the Smithsonian. He also built a steam-driven bicycle, one of the first motorcycles. The engine was on the steering column, and power was applied to the rear wheel by a leather belt. Later he used steam to drive a tricycle.

Bicycles were growing in popularity in the 1870s when George W. Pressey came to see Smith. The inventor impressed the manufacturer and, after successful tests, Smith agreed to make the safety bicycle, paying Pressey a royalty on each one sold. Thus the Star bicycle was born and hit the market in 1881. Although some objections were raised that, with its small wheel in front, it didn't look much like a bike, the Star's speed and safety made it an almost immediate success. The Smithsonian has one (see cover).

Early Stars were driven by straps that wound around the rear wheel hub. Chain drives were introduced in the Eighties, and by the middle of that decade the newest bicycles looked much like today's. Smith pushed his models hard in the face of competition. He employed Tom Finley, a noted athlete, to tour the country on a Star. In Washington, D.C., Finley announced that he would ride down the Capitol steps. The police arrested him, but then relented and let him accomplish the feat. He also rode down Mount Washington and, it is said, did bike tricks in the staid Philadelphia Academy of Music.

Finley won the world bicycle record for the mile: two minutes, 38.4 seconds. Star records ranged from the half mile to the 100 mile and included the "hands-off" half-mile and mile.

Smith correctly concluded that the bicycle craze would slowly die down and, although gross Star sales became several times larger than those of woodworking machinery, he refused to allow his original product to be neglected. He did, however, inspire the use

Commuters pedal home on the Smithville bicycle railway. Drive wheels hung on a monorail.

Today's bike fad, endorsed by environmentalists, sends families winding through Central Park.

of the bicycle to solve a major problem. Smithville did not have enough houses for all of Smith's employees, so almost half of them lived in Mount Holly. The connecting railroad was principally used for freight, and the railroad company refused to add passenger runs. So Smith put an employee, Arthur E. Hotchkiss, to work planning the world's first bicycle railroad.

Although it wasn't finished until after Smith's death, the Hotchkiss Bicycle Railroad remains a testament to his foresight. It was essentially a grooved metal monorail, held up by a trestle, from which the cycles hung. They held one to four passengers, who did the work, pedaling from the outskirts of Mount Holly to the center of Smithville, crossing the Rancocas Creek seven times, all in from eight to ten minutes. It lasted from 1892 to 1898, and a ride on it became a popular Sunday diversion for young couples. They would line up outside the Pine Street terminal in Mount Holly and wait for hours to take turns. Gradually, most of the employees got their own bikes, and the novelty of the railroad wore off.

In management-labor relations, Smith was years ahead of his time. He paid top wages, held to a nine-hour day, closed his plant on Saturday noon and kept his employees' homes in good repair. His company store was well stocked and inexpensive. A Smithville Beneficial Association made loans to his employees. He footed the bill for the Smithville Silver Cornet Band and later paid its members for their services in his political campaigns. The band once gave a concert in the Philadelphia Academy of Music.

Hezekiah's zoo consisted mostly of animals that he captured on hunting expeditions in Maine and Canada. He got "February," his moose, as a calf in Maine and broke him to harness. The story goes that February escaped once and was found 20 miles away among the cows in a pasture.

Smith experimented in his greenhouse and on his nearby farm, testing out all-brick barns—so tightly built that the hay became moldy—and an ultramodern gristmill—which developed too many problems to solve in his lifetime. While abroad, he commissioned

an Italian sculptor to do a statue of Agnes in marble. He had it placed under a specially built canopy in the formal garden of the manor house.

When Agnes died in 1883, Smith spent hours before that statue. Friends said that he never really regained interest in life. He died four years later and was buried beside Agnes in St. Andrews Episcopal Cemetery in Mount Holly. His will left the bulk of his estate to establish a boys' mechanic school, and he requested that he be buried in an iron casket, sealed in concrete.

Less than a month after the burial, the real Mrs. Hezekiah B. Smith arrived in Smithville. She was formerly of Woodstock, Vermont, and late of Savannah, Georgia. With her was her son, Elton. The fact was, Smith had been married before coming to New Jersey and had never been granted a divorce.

Captain Elton A. Smith, as the son was known, succeeded in breaking Hezekiah's will, directed that the statue of Agnes be smashed to pieces and thrown into the Rancocas Creek and ultimately became president of the H. B. Smith Machine Company. He was unsuccessful, however, in trying to have his father's body exhumed for reburial in Vermont. There was no available machinery big enough to lift such a monstrous chunk of concrete.

The Star bicycles were produced until 1910. By then bikes looked much as they do today—with wheels of equal size—but the boom had petered out because all popular attention was riveted on automobiles. In other countries bicycles continued to develop as a cheap and useful means of transportation. Thus when the present bicycle boom began in America, European models with their light cruising frames and gear shifts showed the way to American manufacturers. Today, perhaps ironically, a new status symbol among pollution and sports-conscious Americans is the bike.

The demand for bicycles is enormous. Children's models are almost forgotten in the rush for adult bikes. New York businessmen pedal through Manhattan traffic jams on three-speed English types. Suburban ladies swirl through shopping centers with their handlebar baskets crammed with groceries. The sports-car set cruises country byways on ten-speed, drop-handlebar racers that may cost as much as $400. Bicycle manufacturers, months behind in their orders, happily foresee bikes outselling cars this year for the first time since the Gay Nineties. Hezekiah Smith would have been delighted to help fill the demand. But if anyone has come up with another bicycle railroad like the one in Smithville, news of it has not leaked out.

Smith's company still makes machinery, and the town hasn't changed too much. As for Hezekiah, he lies in an unmarked grave beside Agnes.

Modern ten-speed weighs 35 pounds, costs about $90 and can hit 45 miles-an-hour on a straightaway.

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■ **Meroë** A 21-day archaeological excavation of a prehistoric site at Meroë in the Sudan. Chief Scientist: Dr. Peter Shinnie, Department of Archaeology, University of Calgary, Alberta, Canada, and University of Khartoum, Sudan. Cost $1430*/15 August-5 September

*Plus Airfare

Book reviews

Glacier Ice
Austin Post and Edward R. LaChapelle
(University of Washington, $20)

A breathtaking assortment of black and white spectaculars—all of glaciers—fills this scholarly coffee-table book. In aerial and long-view photographs, the ice flows look like broken glass, like dripping ice cream, like contour plowing, like frozen streams of milk.

The picture above, taken in the French Alps, shows band ogives—alternating light and dark ribbons on a smooth ice surface. The formations originate from a glacier passing down a narrow icefall.

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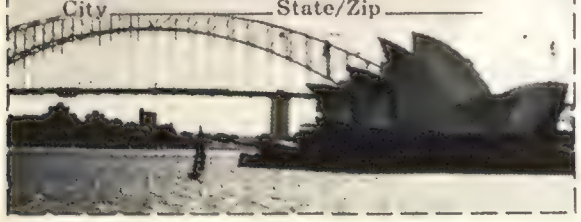

The Hunting Peoples
Carleton S. Coon
(Atlantic-Little, Brown, $10)

Carleton S. Coon, the distinguished and controversial anthropologist at Harvard, defines hunting peoples as those who raise neither crops nor food-producing animals, but rely upon hunting, fishing and collecting wild plant foods for their subsistence. He reminds us that though they now comprise only a small fraction of one percent of the world's population, all of our ancestors fitted the definition 10,000 years ago. Hunting peoples still persist in regions unfit for agriculture or lacking natural resources which civilized men have coveted.

Drawing his data largely from published descriptions, Coon gives a lucid and detailed account of the variety of ways of life to be found among these peoples—ranging from the small, nomadic bands of South African Bushmen, to Indians on the North Pacific Coast who occupied permanent villages of large plank houses, made large sea-going canoes and developed a society which was quite as complex and stable as those of some agricultural tribes.

Hunting peoples in regions where food is relatively abundant have channeled much of their inventiveness into solving problems in human relations and maintaining an ordered society. It is not unusual to find complex kinship systems devised to regulate marriage, a rich oral literature explaining tribal origins and elaborate religious rituals.

The author pays too little attention to the arts of the hunting peoples. It is unfortunate, also, that he eliminates the Plains Indians of North America from serious consideration on the sole grounds that they obtained European horses during the historic period. Plains Indians hunted big game on foot for thousands of years *before* they acquired horses, and many tribes of the region continued to rely upon buffalo for subsistence until these animals were almost exterminated. We know a great deal about the pedestrian days. It is certain, for example, that some nomadic tribes had trading relations with agricultural peoples, which seems to refute Coon's apparent contention that the cultures of hunting peoples, before their historic contacts with Europeans, were self-created ones.

Coon concludes that successful hunters need to "know as much about the resources available in their territories as most Ph.Ds know about their special subjects," and that, "without courses in sociology and psychology, or special classes in sex education, they know at least as much about human nature as most of us do." Such statements may be as difficult to refute as they are to prove.

This sympathetic portrayal need not cause urbanites, frustrated by traffic jams and bored by their jobs, to yearn for the high adventure of these small do-it-yourself societies. Coon makes it clear that the world of hunting peoples was no less beset with anxieties than our own. They fear hostility and sorcery, and frequently call for supernatural protection from natural calamities, sickness and death. They too are very human beings.

—John C. Ewers
Senior ethnologist,
Smithsonian Institution

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Lost America
Edited by Constance M. Greiff
(Pyne Press, $17.95)

Here is sad reading indeed: a gloomy roll call of buildings from the Atlantic to the Mississippi which have been torn down in the American rush to build supermarkets, faceless office buildings and (most often) parking lots. The Buckingham-Chappelear House of Zanesville, Ohio (above) dates from the mid-19th century and has earned its share of scorn for "gingerbread." But it's a heritage, and it's gone—since 1948.

And, say the authors, we are all the poorer for this and the scores of other losses depicted here.

The pictures are all black and white since they were taken when the old structures still stood.

The foreword to this nostalgic volume is by James Biddle, president of the National Trust for Historic Preservation in Washington, D.C.

The Sway of the Grand Saloon
John Malcolm Brinnin
(Delacorte Press, $15)

When approaching a 599-page book, I fear penguinism: that I am going to learn more about something (in this case ocean liners) than I wish to know. When the author confides that the first word he spoke as an infant was a liner's name, and intimates that he has been researching this leviathan ever since, my mental flags spell out "you are standing into danger."

But Professor Brinnin is a poet, I say, and that must help. And he's got all that good material to hand: *Great Eastern* and *Titanic;* emigrants suffering toward a new nation and ladies gadding toward the "season"; men of salt by day and ships afire by night. For helpers he can call up a solid crew from Mark Twain to Charles Dickens, Oscar Wilde, Lucius Beebe . . .

Still on watch, I leaf through and strike a reassuring passage: "Of all the scourges visited upon the traveler by sea—piracy, boredom, satyriasis, nymphomania, mildew, impressment into a foreign navy, scurvy, gluttony, claustrophobia, agraphobia, hi-jacking, shanghaiing, sun stroke, malaria, paranoia, diarrhea, shipwreck, fire, ice, fog and St. Elmo's fire—the one claiming the greatest number of victims and responsible for the deepest suffering was, by all odds, seasickness."

Well, now. Perhaps we'll have a good voyage together after all. And we most assuredly do, after some dallying amid reefs of fact that threaten to snatch out the bottom of our interest before we're fully underway. The last three-quarters or so of *The Sway of the Grand Saloon* is a joy; after all those pages I was sorry to see the index looming ahead.

Professor Brinnin's "A Social History of the North Atlantic" begins precisely on January 5, 1818, with the sailing from New York of the first scheduled Atlantic carrier, the *James Monroe* of the Black Ball Line. As the pace of the ships increases—from sail to steam, paddle wheels to screws and turbines, the book picks up with them. As designers try to bring more comfort to cabins and steerages, Brinnin becomes more comfortable in his tale. But when the final years bring floating farragoes of interior design with poor taste seldom equalled on land, the book never falls into the same trap.

It was a grand era over which the grand saloon held sway, full of follies and heroics, monumental greeds and rivalries, that period that ended September 25, 1967 as the *Queen Mary* and the *Queen Elizabeth* spoke each other for the last time along the Great Circle of the North Atlantic. Their combined speed as they saluted, each destined for tied-fast desuetude, was just under 60 miles an hour. That figure, once superb, was fatal.

But I wonder whether the passengers on whatever craft succeed the 747s with their 600-mile-an-hour lounges will remember their own transocean greyhounds with anything approaching the same awe and affection.

—Frank Sartwell
Freelance writer and sometime contributor to SMITHSONIAN

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American Indian Portraits
Edited by Charles R. Reynolds jr.
(Stephen Greene, $12.50)

This is Hostine Bagota, a Navaho. We know nothing else about him, not even who took this remarkable portrait. It is one of 119 similar photographs in this collection. It was discovered in 1965 in the American Museum of Natural History and dates from the 1913 photographic expedition financed by Rodman Wanamaker of the Philadelphia department store family.

Reynolds says the expedition leader gave no credits for photographs, but admitted to having a three-man staff, all of whom were photographers. Who took what remains a mystery, but this splendid record shows a sensitivity and understanding of Indians that belies the fact that Custer's last battle was still a sore point among good patriotic Americans.

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Smithsonian acquisition

Rural post office in the capital

From the hills of West Virginia to the halls of the Smithsonian comes this mid-19th-century general store and post office. Built in Headsville, it now stands in the Museum of History and Technology, complete with pot-bellied stove, shelves of high-button shoes and patent medicines and a postal service staff to cancel your mail.

Smithsonian highlights

Renwick Gallery
This national showcase for American design, crafts and the decorative arts is now open to the public. Named for its architect, James Renwick (see pp. 62-69), the gallery is currently showing the following exhibitions: *James Renwick in Washington* is a survey of the architect's contributions to the Capital; *Woodenworks* shows the furniture of five 20th-century American craftsmen; *Design is . . .* explores the nature of design, using objects from Smithsonian collections and contemporary creations by craftsmen and industrial designers; *Selections from the Index of American Design* is a sampling of the great archive compiled by American artists during the Depression; *The Glass of Frederick Carder* displays glass objects by the man who founded the Steuben Glass Works in 1903; *Pueblo Pottery: Zuni and Acoma Designs from Smithsonian Collections* is the first of a series of exhibitions calling attention to the role of the Indians as this country's indigenous designers; *The Four Continents* is a collection of some 80 objects from the Smithsonian's Cooper-Hewitt Museum of Decorative Arts and Design in New York City; and *American Architecture: Photographs by the Late Frank Roos* is a tribute to a scholar who was one of the first to recognize the special qualities of American design.

Musical Weekend in Washington
The Friends of Music at the Smithsonian and the Division of Musical Instruments will present three days of music from April 28-30 and will include tours of the Smithsonian Institution, the Kennedy Center, Wolf Trap Farm Park for the Performing Arts, and a round of special events. This weekend will be a benefit for Smithsonian Educational Programs in the field of music. For information write: Mrs. Lois Howard, Division of Musical Instruments, Museum of History and Technology, Room 4124, Smithsonian Institution, Washington, D.C. 20560.

Division of Performing Arts
For ticket information on the following presentations, call 202-381-5395:

"Eureka," a fantasy based on discovery and invention, will be presented by the Alan Stevens puppet company through February. The original show, written especially for the Smithsonian group, will be performed twice daily, Wednesday through Friday, and three times daily on weekends.

"Music From Marlboro," a chamber concert, will be presented on February 5 at 5:30 P.M. Selections by Schubert, Ravel, Fauré and Brahms will be performed.

"Folk Concert" featuring Bill Williams playing the guitar and singing old-time blues will be held in the Spencer F. Baird Auditorium of the Museum of Natural History on February 11 at 8:30 P.M.

"Concert of Music" by Steve Reich, one of the leading contemporary composers of Live/Electric music will take place at the Renwick Gallery on February 26 at 8:30 P.M.

Friends of the National Zoo
"Anthropological Discoveries of Ancient Man in East Lake Rudolph," a lecture to be given by the noted anthropologist, Richard Leakey, at 8:00 P.M. on February 19 at Lisner Auditorium, George Washington University. For ticket information call 202-232-4500.

Associates Events
"An Evening with George Nakashima," an illustrated lecture by the noted designer-craftsman and architect will be presented on Tuesday, February 8 at the Renwick Gallery. Seating will begin at 8:00 P.M.

"Stately Ghosts," an illustrated lecture, will be given by Lord Montagu of Beaulieu on Tuesday, February 22 at the Spencer F. Baird Auditorium in the Museum of Natural History. Seating will begin at 8:00 P.M.

National Portrait Gallery
"Washington in the New Era, 1870-1970," surveys the history of the black community in Washington in the period between territorial government and the election of a non-voting delegate to Congress. The exhibition opens February 14.

Arts and Industries Building
"Balloons" depicts the total history of ballooning from how they were invented to future possibilities, covering forms, fabrics and functions. Opens February 25.

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Weekend at the Smithsonian

Created especially for national members of the Smithsonian Associates, this tour from April 21-23, will provide a firsthand exposure to the Institution. The program includes Friday evening cocktails and orientation dinner, tours guided by curators, Saturday evening option of theater or concert, choice of Sunday field trip to Chesapeake Bay Center or visits to selected galleries and concluding reception with Smithsonian staff. Limited number of reservations accepted. Write to Mrs. Patricia Kilkenny, Room 118 SI, Smithsonian Institution, Washington, D.C. 20560 for costs and reservations.

Tours for Associates

Study tours are designed as educational travel for members of the Smithsonian Associates. Smithsonian staff or other experts accompany all tours. For information, see below.

Foreign Study Tours
For information: Miss Bliss Schumann, Room 123 SI, Smithsonian Institution, Washington, D.C. 20560.

Australia and New Zealand: The tour will go via Fiji and return via Tahiti with visits to Canberra, the Australian Outback, Great Barrier Reef, Tasmania—March 24-April 27.

Mexico and Guatemala: A visit to historic sites of Yucatán, Oaxaca, Mexico City, Tikal and Antigua—April 3-21.

"No Tour" Tour: Dulles International Airport to Paris—May 29-June 19.

Eastern Turkey in the Spring: A tour to include Lake Van, Armenian churches, Trabzon and Istanbul—May 30-June 18.

Greece and Yugoslavia: A classical tour of Greek archaeological sites with a visit to Yugoslavia's Adriatic coast and inland sites—June 12-July 10.

"No Tour" Tour: New York to Frankfurt—July 3-25.

King Arthur's England: Roman Britain (including Bath), ending with London—July 11-August 1.

Russian Museum Tour: A tour to include Moscow, Leningrad, Kiev, Georgia with two nights in both Poland and Finland—September 12-October 3.

Domestic Study Tours
For information: Mrs. Patricia Kilkenny, Room 118 SI, Smithsonian Institution, Washington, D.C. 20560

Death Valley National Monument: A look at the geology, climate, history in a desert region—April 14-20.

Navaho Land, Arizona, New Mexico, Utah: The past and present will be explored in the 25,000 square-mile Navaho Nation—May 21-28.

Windjammer Cruise, Maine: Six days of schooner sailing off the coast of Maine with several shore excursions—June 25-July 1.

Smithsonian Highlights continued

"Man's First Step on the Moon," a tapestry designed by the French artist Mathieu Matégot and woven in the famous French tapestry manufacturing center of Aubusson, is on display in the Hall of Aerospace Art.

Freer Gallery of Art
Selected leaves from a collection of Armenian Manuscripts will be on display through February. From the Freer Gallery's collection of Biblical manuscripts, these leaves were chosen for their special artistic as well as scholarly interest.

Museum of History and Technology
"Early Electrical Appliances," a collection of old household items including toasters, irons, fans and eggbeaters, is on exhibit in the Hall of Electricity.

Museum of Natural History
"Greenland: Arctic Denmark" is an exhibit showing the past and present of this northern island largely surrounded by the Arctic Circle. The history, culture, ecology and future economic development will be displayed.

National Collection of Fine Arts
"John Steuart Curry (1897-1970)" is a selective representation of four paintings and 20 drawings of this Midwestern regionalist.

"Karl Schrag" is an exhibition of 65 prints of the German-born artist, now 59, whose works have been widely shown in this country and in Europe.

"Modern Art from the NCFA Collection" is the first of a series of exhibitions showing contemporary paintings and sculptures from the Museum's permanent collection.

"Drawings by William Glackens (1870-1938)" includes some 60 works of this noted Ash Can School artist. Opens February 25.

Traveling Exhibition Service
For a complete listing, write: Traveling Exhibition Service, Smithsonian Institution, Washington, D.C. 20560.
- Murray, Kentucky—"Recent British Prints: 15 artists," (Murray State University, February 5-March 5).
- Bemidji, Minn.—"International Prints," (Bemidji State College, Feb. 19-March 19).
- University Park, Pennsylvania—"The Historic Architecture and Urban Design of Nantucket," (Pennsylvania State University, February 5-March 5).
- Ripon, Wisconsin—"Posters from Denmark," (Ripon College Art Gallery, February 12-March 5).
- Macomb, Illinois—"The Genteel Female," (Western Illinois University, February 5-March 5).

Book Bargains from the *Smithsonian Institution Press*

Christmas is past—the January white sales are over, but now the Smithsonian Press is conducting its own February book sale, discounting to Smithsonian Associates a selection of books and pamphlets, not the usual 20% off but 50%.

Yes, 50% off!

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For student and pleasure readers alike these offerings at these prices are an extraordinary value.

Offered one time only—to Smithsonian Associates. Sale ends March 31, 1972.

1. The Indians of Texas in 1850 by Jean Louis Berlandier. What was Texas like before its accession in 1845? Indian country, of course, but what else? You can get a glimpse of this little-known period of Texas history through the eyes of a Frenchman who traveled there in 1828-29. This is a beautifully printed book worth the price for its graphics alone—and what patriotic Texan or lover of Indian lore can be without it?

209 pages 59 illus. List Price **$10.00**
SALE PRICE **5.00**

2. Smithsonian Collection of Automobiles and Motorcycles, by Smith Hempstone Oliver and Donald H. Berkebile. Here they are . . . from the Smithsonian's own collection: a Model-T Ford from 1913; a 1903 Cadillac, a Pierce-Arrow of 1912, and over forty other historic cars, trucks, and **motorcycles.** Illustrated with close-up photos and plenty of technical data. This book is rated (Read) for the entire family if you are interested how Americans got wheels.

164 pages 126 b&w illustrations Paperbound
LP **$2.95**
SP **$1.50**

3. Archipenko: International Visionary, Donald H. Karshan, Editor. A contemporary of Apollinaire and Picasso, an international visionary of the artistic world. Alexander Archipenko is one of those leaders of 20th-century art to whom contemporary forms owe so much. Here is a lavishly illustrated book of his life and work, combining many of his own writings with critical comments from many countries in which his influence was felt. For the serious student, for art lovers who love handsome art books.

116 pages 175 b&w illustration 4 color plates
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4. The Art of Organic Forms, by Philip C. Ritterbush. An unusual study of the relationship of organic forms and artistic forms, emphasizing the biological discoveries of the last century and their impact upon the early 20th-century painters who began to employ curvilinear forms in compositions, as though to express the essential beauty of nature without imitating it directly. A valuable book for the serious art lover. Invests commonly-seen shapes with new meaning.

149 pages 68 illustrations LP **$10.00**
SP **5.00**

5. Presidential Portraits. The National Portrait Gallery assembled from its own collection and others around the world an inaugural exhibition of presidential portraits from George Washington to Richard Nixon. The exhibition catalog contains biographical information and a full-page portrait in black and white of each of our thirty-six presidents. This is a splendid reference for every citizen and a delightful book for youngsters studying American history.

73 pages 36 b&w illustrations LP **$1.25**
SP **.65**

6. Plans for Making an Early American Loom. For all hobbyists and serious weavers, this loom packet provides detailed drawings of the parts of a 19th-century loom, suggestions for constructing the loom and bench, and a brief background of the original loom which is in the Smithsonian textile collection.

LP **$1.50**
SP **.75**

7. Masters of the Air: Highlights of Aeronautical History for the Young Reader. Written especially for young people, this 32-page booklet traces the development of heavier-than-air flight from the gliders of the last century to the supersonic jets of today.

LP **$.75**
SP **.35**

8. Cal Rogers and the "Vin Fiz". The Story of the First Atlantic to Pacific Flight. In September 1911 a young man took off from Long Island in a 4-cylinder, 35 horsepower biplane. His goal? The Pacific Ocean within thirty days and a prize of $50,000. The original Vin Fiz can be seen in the Smithsonian.

24 pages illustrated LP **$.85**
SP **.40**

Have you been to Washington lately, or are you planning to come? Don't miss obtaining copies of these guides to some of the collections and a strikingly illustrated history of the Institution.

9. Exhibits in the Museum of History and Technology. In this striking building—the newest in the Smithsonian complex on the Mall—are exhibits devoted to the history of science and engineering and the cultural development of the United States since the discovery of America. Here are the original Star Spangled Banner, the First Ladies Hall, and other displays on transportation, stamps and coins, china and glass—glimpses of the way our forebears lived and worked. This guide describes all of the exhibit areas with many illustrations in black and white and color. It will be invaluable on your next visit or whet your appetite to plan a trip.

128 pages LP **$1.75**
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10. Highlights of the National Collection of Fine Arts. A sparkling introduction to American art from colonial times to the present. The 64 pages of text are embellished with 49 illustrations, eight in color. This is a highlight guide to the more than 8,000 American paintings, sculptures, prints, drawings, watercolors, and miniatures which make the National Collection of Fine Arts the greatest collection of American art anywhere.

LP **$1.50**
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11. The National Aeronautical Collections. One of the greatest components of the Smithsonian's great name is its air and space collection—from the original Wright brothers plane through Lindbergh's Spirit of St. Louis to the full-scale lunar landing module. This profusely illustrated booklet explores man's earliest efforts to fly as shown at the Smithsonian and carries the reader all the way through rocketry. Well indexed, this is a great book for buffs of World Wars I and II, and other fans of the Red Baron.

168 pages over 100 photos LP **$2.00**
SP **1.00**

12. The Smithsonian Institution. This handsome volume, prepared by the editors of American Heritage magazines tells of the strange bequest under which the Smithsonian Institution was founded, its early years, and its vast reputation among scholars around the world. Over 175 illustrations; many in full color, document the wide diversity of the Smithsonian's activities—its famed collections and its scholarly research in science, technology, history, and art.

125 pages 110 b&w, 72 color illustrations
LP **$2.95**
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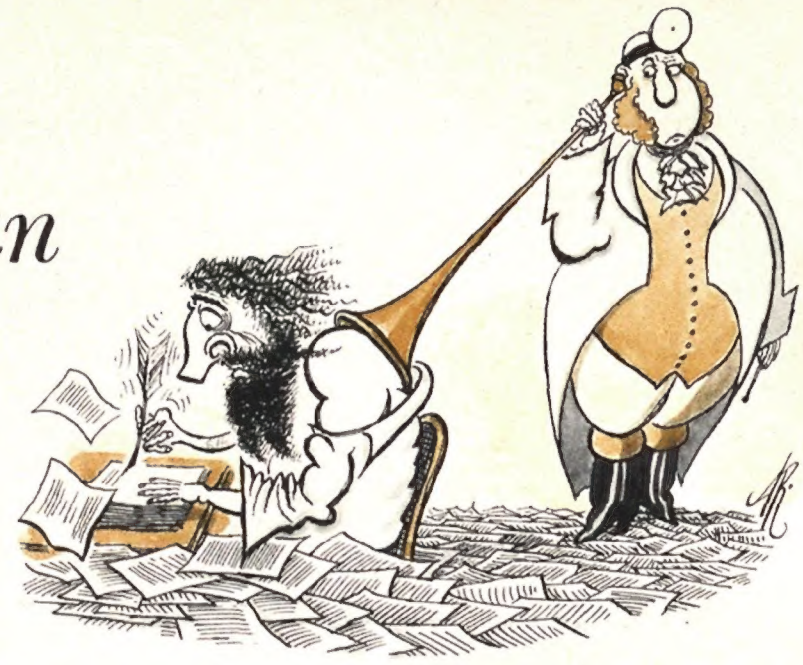
By Patrick Ryan

Are virgins riskier than great expectations?



The Inimitable Boz also proved to be the Uninsurable Boz.

There are those of lazy conscience like myself who comfortably accept the dogma of the Greek mythologists that the Fates weave for each of us a predetermined web of destiny from which it is vain to try to struggle free. But the energetic majority gamely attempt to confound the march of Nemesis by the regular sacrifice of paying insurance premiums.

Although, sadly, some are thwarted in their ambitions by medical rejection, they may now take comfort that their spurning puts them in the highest literary company. Documents recently discovered in an English junk shop show that Charles Dickens, at 25 years of age, was turned down for life insurance by the Sun Life Assurance Company of Cornhill, London. A present-day spokesman for this ancient but then somewhat inhospitable company recently commented about the application: "We refused to insure Mr. Dickens, we decided he was overworked or something." The Inimitable Boz might have appeared in that condition since he was just then scribbling into the homestretch of the 20 monthly installments of *Pickwick Papers.*

The insurance company was perhaps too cautious since Dickens lived another 33 years before he died, worn out, like so many since, partly by too much talking to Americans: His health broke after his second American lecture tour. But, to give the probability peddlers their due, they have grown much more accommodating down the years.

Only about one applicant in 10,000 is now turned down in the United States for an ordinary life insurance policy. Even the safety rating of astronauts has vastly improved. When *Life* magazine considered insuring the first seven astronauts they had under literary contract, the price quotation was so prohibitive that it proved to be more economical to provide for family payments out of the magazine's own funds. But when the first seven came back safely, the rates dropped to commercially acceptable levels.

Other occupations to be avoided if you want to get cheap insurance are, in descending order of hazard: test pilot, experimental high-speed car driver, stunt man and bullfighter. Croupiers at Las Vegas may be relieved to learn that they are now considered to be as reliable a risk as school teachers. Bartenders, perhaps due to the unpredictability of their customers, have to pay most insurance companies the same premium that is demanded from a worker in the nitroglycerine industry. Housewives, however, may be secure in the knowledge that their occupation is reckoned one of the safest anyone can have.

In offering cash compensation for misfortunes less definite than death, the insurance market now spreads a well-nigh infinite wing. Somebody, somewhere—culminating probably in Lloyds of London as last resort—seems prepared to offer cover against the quirkiest malevolence of fate. Many of the most bizarre policy-seekers desire financial defense against damage to the human anatomy. The chin-proud members of the Whiskers Club in Derbyshire, England, each had their cultivated beards insured against fire and theft for $50 a pelt. They might have increased it for accident coverage, too, had they considered the sad fate of the hirsute Austrian burgomaster who, in 1567, grew his beard to eight feet nine inches long, only to trip over it on the stairs, fall down and break his neck.

Top belly dancers have insured their navels for minor fortunes against damage or displacement—a precaution well justified for so focal a part of their terpsichorean equipment, and supported by all who remember the famous Egyptian belly dancer of World War II who possessed a navel of such surpassing mobility that she was said to wink messages with it in Morse code to spies of all nations in the night clubs of Cairo.

More intimate still was the insurance policy sought for an Italian girl who was leaving home to work as a waitress in Germany and whose family decided to insure her virginity. They had to shop around a bit for honor protection but eventually arranged a $1,400 policy with the Italo-Peruvian Insurance Company at premium payments of $1.75 a month. Old-world gallantry has precluded my making further research into whether the sporting insurers had to pay up.

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